THE FISHES OF THE INDO-AUSTRALIAN ARCHIPELAGO

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THE FISHES

OF THE

INDO-AUSTRALIAN ARCHIPELAGO

V

ANACANTHINI, ALLOTRIOGNATHI, HETEROSOMATA, BERYCOMORPHI, PERCOMORPHI:

Families: KUHLIIDAE, APOGONIDAE, PLESIOPIDAE, PSEUDOPLESIOPIDAE, PRIACANTHIDAE, CENTROPOMIDAE

with 98 illustrations

BY

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INTRODUCTION.

In the present volume, the fifth of the series of volumes devoted to the description of the fishes of the Indo-australian Archipelago, are treated the orders *Anacanthini*, *Allotriognathi*, *Heterosomata*, *Berycomorphi* and of the large order of *Percomorphi* the families: *Kuhliidae*, *Apogonidae*, *Plesiopidae*, *Pseudoplesiopidae*, *Priacanthidae* and *Centropomidae*.

According to the very numerous representatives of the lastnamed order, some of the succeeding volumes will continue their description. We thought it therefore advisable to defer a discussion about the systematic division of the order *Percomorphi* in suborders, families and subfamilies till the description of the indo-australian genera and species is terminated. At the same opportunity an artificial key to this subdivisions will be given.

As the completion of the last half of this volume had to be delayed on account of other duties of the authors, the pages on which the *Heterosomata* are described had already left the press before some valuable papers by J. R. NORMAN about indian and australian Flatfishes had appeared. Our text missed therefore the benefit of this source of information. Under the head of „Addenda" we have tried to compensate this omission.

The collections of fishes of which we could dispose are already mentioned in the Introductions to the preceding volumes. Besides these we had the good fortune, that Dr. K. W. DAMMERMAN, Director of the Zoological Museum of Buitenzorg (Java) and Prof. H. C. DELSMAN, head of the Government Laboratory for Marine Investigations at Batavia, had the kindness to lend us the not yet named ichthyological collections in the institutions under their charge.

A similar collection, brought together at Ambon, we received by exchange from the Royal Colonial Institute at Amsterdam.

It is a pleasing duty of thanking these gentlemen, who have so cordially given their assistance and thus helped to facilitate our work. Our thanks are again due to Prof. E. D. VAN OORT, Miss Dr. C. POPTA and Mr. F. P. KOUMANS, who put the material of BLEEKER's collection in the Rijks Museum van Natuurlijke Historie at Leiden at our disposal. For similar help we have to thank Mr. C. TATE REGAN, Director of the British Museum (Natural History), and especially Mr. J. R. NORMAN for facilitating our work, while one of us repeatedly studied types in that Museum.

Dr. J. C. KONINGSBERGER, now Minister of the Colonies, who from the beginning has promoted the publication of the volumes devoted to the fauna of the indo-australian Archipelago, has continued to show the same interest in this publication, which we gratefully aknowledge.

It will be of service to those who use the present volume, to remember, that in the Introduction to the second volume we have defined the character and geographical limits of the area from which the fishes are described.

For their benefit we repeat also the technical informations, given in the Introduction to the former volumes of this series.

„In describing the fishes we understand by *Length*, in the discussion of the proportions, the distance between the snout and the base of the caudal fin; in giving the largest size known for a species, we include the caudal fin.

The *Head* is measured from the tip of the snout to the end of the opercle, its proportion to the length is indicated e. g. as follows: head 4—$4^1/_2$ means, that the length of the head is contained 4 to $4^1/_2$ times in the length.

Height is the maximum height; in special cases it is indicated how it is measured; the figures placed behind „height" indicate how many times it is contained in the length.

The size of the *Eye*, the length of the *Snout*, of the *Jaws* etc. are compared with the length of the head; thus „eye 4" means, that its diameter is $^1/_4$ of the length of the head.

In counting the *Scales*, under „*L. l.*" is given the number of scales, with or without sensory organs, between the head

and the caudal fin or, in most cases, between that fin and the upper corners of the opercle.

L.tr. $\frac{3\frac{1}{2}}{6\,(7)}$ signifies, that there are $3\,^1/_2$ rows of scales between the dorsal fin and the lateral line and 6 to 7 below it, the lateral line itself is in this case not counted. In other cases the lateral line itself is also counted f.i. *L.tr.* $\frac{4\frac{1}{2}}{1\quad 1}$ (between D. and V.), which signifies, that there are $4\,^1/_2$ rows of scales between the dorsal fin and the lateral line, one in the lateral line itself and one between it and the ventral fin.

In the *Fin formulae* the spines and the simple, non-branched rays are generally indicated by a figure, separated by a point from that of the number of the branched rays.

The last soft ray of the dorsal and anal, in case it is cleft to the base and therefore counted as two by some authors (BLEEKER e.g.), is reckoned as one, being supported by a single pterygophore.

The *Gillmembranes* may be totally free from each other and from the isthmus; they may be united, but still remain free from the isthmus; or they may be connected with the isthmus and with each other; when in the last case the posterior border of the united gillmembranes is not quite adnate to the isthmus, there remains a free posterior margin, running as a fold over the isthmus from one gillopening to the other.

We follow the law of priority and use the oldest name which can with certainty be made out by the description, belonging to a certain species. Its author is quoted as the author of the species and his paper is quoted in the first place, when there is no stringent reason to do otherwise.

Mention is further made of all synonyms; besides, we have quoted those papers, which contain a description of the species. If it is a widely spread one, only those papers are quoted, which contain a description of or give some informations — others than those regarding locality only — about Indo-Australian specimens of that species.

According to the international rules of nomenclature we have neglected the generic names, as e.g. those of SWAINSON, which are not accompanied by a description.

We have recorded under: „nomina indigena" those native

names, which seemed to us to be trustworthy. We are of opinion that no great value ought to be attached to them, as the unavoidable series of difficulties is still enlarged by the fact, that the authorities for those names have mostly been European ichthyologists and no linguists."

As in the former volumes we have the pleasure to express our indebtness to Mr. J. F. OBBES, who so ably draw the figures, which illustrate the present volume and also to Mr. C. PELTENBURG, head of the publishing and printing firme E. J. BRILL Ltd. of Leiden, for his help while publishing this volume.

Eerbeek / Amsterdam, January 1929.

MAX WEBER.
L. F. DE BEAUFORT.

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Order ANACANTHINI.

Airbladder if present, without pneumatic duct. Body scaly, scales cycloid or ctenoid. Fins without spinous rays, except the two first rays of the first dorsal of some Coryphaenoididae. Vertical fins very long; caudal homocercal or wanting. Ventrals with 1 to 9 rays, their origin before or somewhat behind that of pectorals. Pectoral arch attached to skull. Pelvic bones posterior to the symphysis of the cleithra and only loosely attached to it by ligament. Mouth terminal or inferior; more or less protractile. Teeth in jaws in bands or in a single series; vomer, palatines and pterygoids with or without teeth. Gillopenings wide, gillmembranes usually free from isthmus. Gills pectinate, four in number, with four gillslits. Lower pharyngeals separate. Skeleton ossified; parietals separated by the supraoccipital, no orbitosphenoid.

Key to the families of Anacanthini.

1. Caudal fin present; ventrals jugular.
   a. Caudal fin confluent with anal; a short dorsal fin situated behind base of pectorals . . . . . *Ateleopodidae* p. 1.
   b. Caudal fin separate; dorsal fin extending along the back, often divided into two or three portions . . *Gadidae* p. 4.
2. No caudal fin, dorsal and anal confluent at end of strongly tapering tail. Ventrals below or somewhat behind origin of pectorals . . . . . *Coryphaenoididae* p. 12.

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1. Fam. ATELEOPODIDAE.

No airbladder. Head rather large, with muciferous cavities; trunk short, tail elongate, compressed, tapering. Skin tender, more or less gelatinous, scaleless or partly covered with non-imbricate, extremely thin scales of various size; lateral line present, inconspicuous, pores widely separated. Mouth inferior

or subterminal, the intermaxillaries strongly protractile downwards, the maxillaries firmly adnate. Two narial openings, the posterior oval or slitlike just before eye. Immediately behind eye may be present an erectile spine, perforating the skin. A band of minute villiform teeth on anterior half of intermaxillaries only or also on mandibles, maxillaries and palate toothless. A short dorsal fin without spines, situated behind base of pectorals; a long anal fin, continuous with the caudal which is homocercal. Pectorals lateral, well developed; their radials represented by a cartilaginous plate. Ventrals jugular, reduced to a stout filament or a stiff, flexible rod, simple or bifid at its end, made up of two many-jointed components of one ray which remain distinct and may separate from each other distally. They are bound together and inserted on pelvis, which forms an unpaired cartilaginous plate with two small ossifications and a pair of long posterior cornua and is movably articulated to the lower surface of the coracoid cartilages [REGAN]. Skeleton in great part cartilaginous. Gillopenings wide, the gillmembranes united and narrowly attached to isthmus with a narrow free border. Seven to 9 branchiostegal rays. Opercular bones hidden by skin, suboperculum excluding operculum from margin of gillopening. Four gills with short, flat gillleaves; the fourth arch with a slit behind; gillrakers few in number, about 7 to 10, short, cartilaginous, armed with small teeth or spines; similar protuberances on fifth leafless hemibranch; no pseudobranchiae.

Distribution: Deep sea fishes of medium or large size. Of the three known genera *Ijimaia* is restricted to Japan; *Ateleopus* ranges from Japan to Hawaiian Islands, to the Andaman and Laccadive Sea and to the coast of Natal. It will therefore probably also befound in the Indo-Australian Archipelago, wherefrom for the present *Parateleopus* only is known.

Note. The taxonomic position of the family *Ateleopodidae* is questionable. GÜNTHER, BLEEKER, STEINDACHNER & DÖDERLEIN and ALCOCK placed it near the *Coryphaenoididae (Macruridae)*; BOULENGER under the name of *Podatelidae* among the jugular *Acanthopterygii* near the *Ophididae*, in which he was followed by GOODE & BEAN and SAUTER. By REGAN *Ateleopus* was made in 1907 and 1910, the type of the separate order *Chondrobrachii*, while in 1911 he described it as "suborder

3. Ateleopoidea of the Iniomi", an opinion agreed upon by JORDAN, TANAKA & SNYDER. Lately SMITH & RADCLIFFE returned to the opinion of GÜNTHER and placed the *Ateleopodidae* "provisionally in the order *Anacanthini* near the *Macruridae*". The taxonomic difficulty arises from the fact, that the *Ateleopodidae* are fishes strongly degenerated by their mode of life in deep sea.

1. **Parateleopus** Smith & Radcliffe.

(SMITH & RADCLIFFE in Radcliffe, Proc. U.S. Nat. Mus. Wash. vol. 43, 1912, p. 139).

This genus differs from *Ateleopus* in the greatly reduced size of the dorsal, which consists of only 3 short rays, and in the

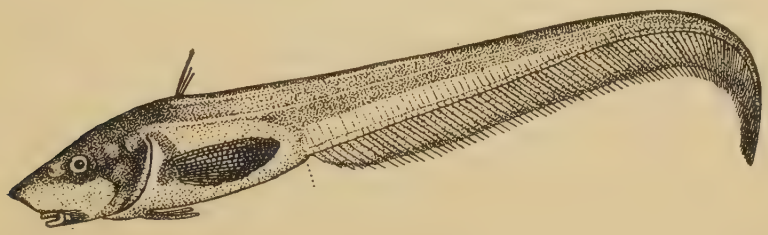

Fig. 1. *Parateleopus microstomus* Sm. & Radcl. $^3/_5$ n. s. [After RADCLIFFE].

much smaller size of the mouth. The head is short and more pointed than in *Ateleopus*, and the strong bony protuberance above and behind the eye is lacking. [After SMITH & RADCLIFFE].

Distribution: See that of the single species known.

1. **Parateleopus microstomus** Sm. & Radcl. [Fig. 1, p. 3].

Parateleopus microstomus Smith & Radcliffe in Radcliffe, Proc. U. S. Nat. Mus Wash. vol. 43, 1912, p. 140.

Dorsal 3; anal + caudal 91; ventrals 2; pectorals 13.

Head short, pointed, 6.14 in total length, 2.16 in distance from tip of snout to vent, greatest breadth equal to snout plus eye; length of head and trunk 2.80 in total length; depth of body 8.32 in total length, 2.93 in head plus trunk; body and tail compressed, tapering; eye 6.32 in head, 2.55 in snout; snout 2.48, fleshy, pointed, projecting beyond mouth about 0.4 of its length; mouth small, semicircular, horizontal, lips fleshy; maxillary 4.55, not reaching vertical to anterior margin of eye; anterior nostril circular, with a low rim, posterior

nostril slit-like, close to eye; no sharp, knob-like structure above or behind eye; a broad band of small teeth on anterior half of each premaxillary; mandible and palate toothless; interorbital 3.17; gills 4, the fourth arch with a slit behind it; gill-rakers 7 in number on anterior arch, armed with small teeth; no pseudobranchiae; skin tender, scaleless; lateral line present, inconspicuous, pores widely separated.

Insertion of dorsal fin behind vertical to base of pectoral, first dorsal ray longest, 2.85, its base about one-ninth length of head; anal long, continuous with the caudal, anterior rays short increasing in length posteriorly, longest ray 2.72; pectorals 1.20, well developed, tips not reaching vent; ventrals reduced to a filament, tapering, 2.28, dissection shows filament to be composed of 2 closely joined rays, under the skin are traces of additional rudimentary rays; interhaemals very distinct, covered by a delicate semitransparent skin.

Color in alcohol: Top of head and body seal-brown, becoming sepia on sides of body and tail and gray on ventral surface; dorsal and pectorals very dark brown; ventrals grayish; margin of anal blackish, becoming lighter basally; lips cream-buff; peritoneum silvery with minute dots of brown. Length 35 cm.

Habitat: Taken with a beam trawl at station 5622 (lat. 0° 19′ 20″ N.; long. 127° 28′ 30″ E.), near Makian Island, Dutch East Indies, at a depth of 275 fathoms, on a bottom of gray mud. [After RADCLIFFE, Proc. U. S. Nat. Mus. Wash. vol. 43, 1912, p. 140].

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2. Fam. GADIDAE.

Airbladder generally present, physoclistic. Body more or less elongate, with moderate tail; covered by small cycloid scales. Head large, its bones mostly firm, or cavernous by muciferous, sensory cavities. Dorsal extending along the back often divided in two or three, the long anal often in two portions. Caudal fin separate, symmetrical, homocercal, supported by neural and haemal spines of posterior vertebrae and by basal bones similar to those supporting the preceding dorsal and anal rays; rays of caudal above and below procurrent. Ventrals before origin of pectorals, with 1—9 rays. Pectoral

pterygials four in number. Mouth moderate or large, terminal, more or less protractile. A mandibulary barbel usually present. Teeth strong, small or villiform in bands or single series; vomer, palatines and pterygoids with or without teeth. Gill-openings very wide, gillmembranes separated or slightly united, usually free from isthmus. Pseudobranchiae none or glandular, rudimentary. Branchiostegals 7 in number. Four gills with a slit behind the last.

Carnivorous, mostly marine fishes, some living in great depths. Mostly in polar and temperate seas, only a few genera are represented in the indo-australian region.

Synopsis of the indo-australian Genera of Gadidae.

I. Two dorsal fins.
   1. First dorsal formed by a single occipital ray; central part of second dorsal composed of dwarfed rays. Teeth in a single series in jaws. . . . . *Bregmaceros* p. 5.
   2. First dorsal above pectorals composed of 5 to 7 rays; second dorsal a large continuous series of similar rays. A band of villiform teeth in jaws. . . . . *Physiculus* p. 7.

II. Three dorsal fins; the first of about 4—5 rays on nape; the second opposite to beginning of anal, immediately behind anus, the third on end of tail, both are pluriradiate. Teeth in a single series in jaws. . . . . *Tripterophycis* p. 11.

1. **Bregmaceros** Thompson.

(Thompson, Ann. Mag. Nat. Hist. IV. 1840, p. 184).
Calloptilum Richardson, Ichthyology Voy. "Sulphur", 1844, p. 94.
Asthenurus Tickell, Journ. Asiat. Soc. Bengal XXXIV. 1865, p. 32.

Moderately elongate, compressed; head small, somewhat compressed, without barbels, cirrhi or spines. Eyes lateral. Mouth small, oblique, terminal, the jaws subequal. Minute moveable teeth on jaws and vomer, none on palatines. Gill-openings very wide, the gillmembranes being united below throat, not attached to isthmus. Seven branchiostegals; pseudobranchiae none. Scales cycloid, deciduous, of moderate size; no lateral line. Fins without spines. Two dorsals, the first formed by a single long occipital ray; the second long, beginning opposite anus situated at about the end of the first third of the length, and consisting of an anterior and posterior elevated

portion connected by a dwarfed portion of isolated spines. Anal of similar construction and length. Caudal more or less emarginate, well separate from vertical fins. Pectorals small, situated in middle of height of body. Ventrals jugular, their origin apposed, composed of five rays, the outer ones extremely elongate. No airbladder, two wide pylorical appendages.

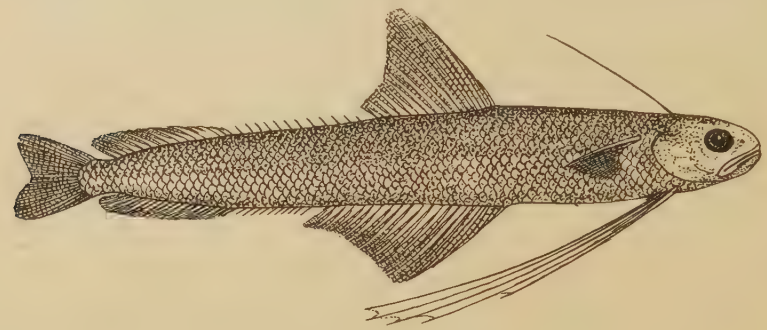

Fig. 2. *Bregmaceros macclellandi* Thomps. n. s.

Distribution: Small tropical fishes, living in costal waters and also met with in the open sea, usually in depths from about 20 to 500 M. but also caught on or near surface.

1. **Bregmaceros macclellandi** Thomps. [Fig. 2, p. 6].

Bregmaceros Macclellandii Thompson, Ann. Mag. Nat. Hist. IV. 1840, p. 184.
Calloptilum mirum Richardson, Ichthyol. Voy. "Sulphur", 1844, p. 94.
Bregmaceros macclellandii Günther, Cat. Brit. Mus. IV. 1862, p. 368.
Asthenurus atripinnis Tickell, Journ. Asiat. Soc. Bengal XXXIV. 1865, p. 32.
Bregmaceros atripinnis Day, Proc. Zool. Soc. London 1869, p. 522. — Fishes India 4°, 1878—1888, p. 418.
Bregmaceros Mc Clellandi Day, Fishes India 4°, 1878—1888, p. 418.
Bregmaceros macclellandii Günther, Zool. Challenger Exp. XXXI. 1889, p. 25.
Bregmaceros Macclellandii Day, Fishes Brit. India II. 1889, p 433.
Bregmaceros bathymaster Jordan & Bollmann, Proc. U. S. Nat. Mus. (1889) 1890, p. 173.
Bregmaceros Macclellandii Goode & Bean, Oceanic Ichthyol. 1895, p. 388 & 531.
Bregmaceros Macclellandii Jordan & Evermann, Fishes North America U.S. Nat. Mus. III. 1898, p. 2527.
Bregmaceros Macclellandii M. Weber, Siboga Expeditie, Fische, 1913, p. 174.

B. 7; D. 1.16—20 + X—XII + 15—22; A. 18—22 + X + 15—22; P. 23—24; V. 5—6; Lat. sc. 58—64; transv. sc. 14—16.

Height conspicuously less than length of head which goes nearly $5^1/_2$ to $6^1/_2$ in length. Eye $2^2/_3$ to $3^3/_4$ in head and about twice in postorbital part of head. Interorbital space convex,

broader than diameter of eye. Upper jaw reaching to middle of eye. Occipital appendage reaching to dorsal. First dorsal and anal lobe much higher than second. Enlarged and elongated ventral rays may reach on second anal lobe. Upper part of pectorals somewhat prolonged, about equal to head without snout. Brown above, silvery minutely dotted with brown; dorsal usually blackish, the other fins more or less hyalin or dusky; their peripheral portion may also be blackish. Length 130 mm.

Habitat: North coast Java, 28 M.! Road of Samarang!; Madura Sea, 330 M.!; Bay of Bima, 30 M.!; Flores Sea, 694 M.!; Strait Molo, 90 M.!; Savu Sea, 247 M.!; Northcoast Sumbawa, 274 M.!; Borneo Bank, 50 and 59 M.!; Celebes (Kwandang Bay) 72 M.!; between Celebes and Saleyer, 462 M.!; Buton Strait!, pelagic; between Wuwoni and Buton Island, 94 M.!; Sula Besi, 22 M.!; Molucco Passage, 1500 M.![1]); Halmahera Sea, 1000 M.![1]); Ceram (Kawa), 36 M.!; Ambon, 54 M.!; Banda Sea, 1500 M.![1]); Waigeu, 141 M.!; near Kei Islands, 90 and 397 M.! — Near Philippines, China Sea, Cochin, Burma, Bay of Bengal, Malabar coast, off the Andamans, Arabian Sea, Pacific coast of South America in depths from 0 to 456 M.

Note. Our specimens from 462 M. have the mucous membrane of the mouth and the covering of the abdominal cavity black.

2. Physiculus Kaup.

(Kaup, Arch. f. Naturgesch. 1858, p. 87).
Pseudophycis Günther, Cat. Brit. Mus. IV. 1862, p. 359. — Challenger Reports XXII. Deep-sea fishes 1887, p. 87.
Leptophycis Garman, Mem. Mus. Comp. Zool. Harvard Coll. XXIV. 1899, p. 182.

Rather robust, more or less elongate, tail compressed and strongly tapering. Head and body covered by small, cycloid rather deciduous scales, lateral line present. Snout broad, obtuse, mouth terminal, oblique, the lower jaw included. With or without a mental barbel. Teeth small, of equal size in villiform bands in jaws, none on vomer or palatines. Gillopenings wide, gillmembranes united below throat, free from isthmus; four

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1) These depths are problematical. The fishes were caught in a vertical net hauled in from the said depth, they could therefore enter the net between 1500 and 0 M. depth.

gills, gillrakers few or numerous, short; small pseudobranchiae may be present. Dorsal divided into two fins, close together, the anterior small, above root of pectorals. Anal a continuous fin, not notched, originating somewhat behind anus, which is situated below or behind base of pectorals. Ventrals inserted before that base, with a narrow flat base and with three to

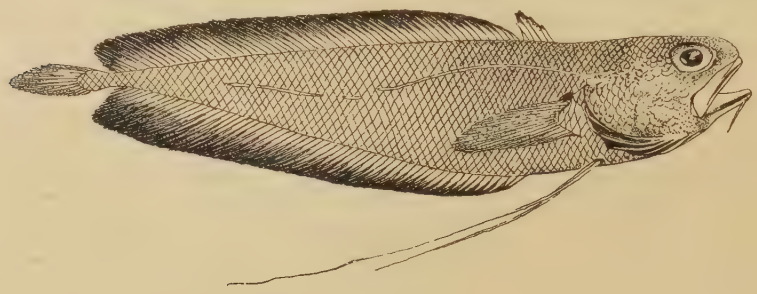

Fig. 3. *Physiculus longifilis* M. Web. $^5/_6$ n. s.

seven rays, the outer filamentous. Caudal somewhat pointed, totally free from dorsal and anal. A large simple airbladder.

Distribution: Living in deep water in the tropical and temperate part of the Atlantic, Indic and Pacific.

Key to the indo-australian species of Physiculus.

1. First ray of dorsal prolonged; ventrals with 7 rays, their outer ray prolonged only just beyond origin of anal. *Ph. roseus* p. 8.
2. First dorsal without prolonged rays.
   a. Ventrals with 3 rays, the outer filamentous ray reaches beyond origin of anal . . . . . *Ph. peregrinus* p. 9.
   b. Ventrals with 6 rays, the outer filamentous second and third ray reach to half and posterior fourth of anal. *Ph. longifilis* p. 10.

1. **Physiculus roseus** Alc.

Physiculus roseus Alcock, Ann. Mag. Nat. Hist. (6) VIII. 1891, p. 28.
Physiculus roseus Goode & Bean, Oceanic Ichthyol. 1895, p. 530.
Physiculus roseus Alcock, Journ. Asiat. Soc. Bengal LXV. 1896, p. 321. — Descr. Catal. 1899, p. 76.
Physiculus roseus M. Weber, Siboga-Exped. Fische, 1913, p. 177.

B. 7; D. 6—7, 64—65; A. 63; V. 7.

Head and trunk broad, tail compressed, strongly tapering. Head nearly $^1/_4$, height, just behind origin of dorsal, $^1/_6$ of total length. Least height of caudal peduncle half length of

eye, which goes 4 times in head and is slightly longer than flat interorbital space. Snout depressed, broader than long, obtusely rounded, as long as eye. Upper jaw surpasses middle of eye. Both jaws with a band of equal, minute teeth. Mental barbel stout, shorter than eye. Ten short gillrakers, swollen at their top. First dorsal originates about half eyediameter behind gillopening, it is connected at its base with second dorsal and anteriorly elevated, the first ray prolonged, about equal to head without snout. Dorsal and anal invested in a fold of thick, scaleless skin; length of their rays about $^1/_3$ length of head. Ventrals inserted far before base of pectorals, about two eyediameters before anus; their distance from one another equal to eye; their outer prolonged ray reaches anal or nearly so. Length of pointed pectorals $^2/_3$ length of head. Caudal narrow, somewhat rounded, it is totally free from dorsal and anal. Scales small; 6 scales between first dorsal and lateral line, which is not complete. In alcohol yellowish brown, belly blackish; anal and dorsal with a dark border. Length 235 M.

Habitat: Between Batjan and Kajoa Islands, 397 M!; Arafura Sea, 310 M.! — Andaman Sea, 338—402 M.

Note. This description is taken from the specimens of the Siboga Expedition and slightly differs from the diagnosis of ALCOCK, who gives the fin formule: D. 6—7, 57. A. 55.

2. **Physiculus peregrinus** (Gthr.).

Pseudophycis peregrinus Günther, Proc. Zool. Soc. London 1871, p. 669.
Pseudophycis peregrinus A. B. Meyer, Cat. peces archip. indias orientales. Anal Soc. Esp. Hist. Nat. XIV. 1885, p. 39.
Physiculus peregrinus Günther, Reports Challenger Exped. XXII. 1887, p. 88.
Physiculus peregrinus Goode & Bean, Oceanic Ichthyol. 1895, p. 366.

D. 7, 62 (ca.). A. 66 (ca.). V. 3.

The height of the body is less than the length of the head, which is two ninths of the total (without caudal). Vent at only a short distance behind the base of the pectoral; tail tapering into a very narrow band, the extremity of which is surrounded by the caudal fin; however, the vertical fins remain separate from one another. Head rather broader than deep, its greatest width being two thirds of its length. Interorbital space concave, its width being less than the diameter of the eye, which is one fourth of the length of the head, and equals

that of the snout. Snout broad, obtuse, rounded, with the upper jaw overlapping the lower; the maxillary extends to below the middle of the eye. Barbel shorter than the eye. Vertical fins of moderate depth, with very fine fin-rays; the first dorsal commences opposite to the base of the pectoral. Pectoral as long as the head without snout. The ventral filament is jugular, extending beyond the origin of the anal, and composed of one longer and two shorter rays. Scales minute and deciduous. Reddish olive (in spirits), abdomen black. Length 125 mm. [After GÜNTHER, not seen by us].

Habitat: Menado, Celebes.

3. **Physiculus longifilis** M. Web. [Fig. 3, p. 8].

Physiculus longifilis M. Weber, Siboga-Exped., Fische, 1913, p. 178.

B. 7; D. 5—7, 56—58; A. 60; V. 6.

Elongate, tail compressed and strongly tapering. Height about $5^2/_3$, head $4^2/_3$ in total length; least height of caudal peduncle much less than longest diameter of eye, which goes 4 times in head and is nearly one quarter shorter than flat interorbital space. Snout depressed, broader than long, obtusely rounded about as long as eye. Upper jaw surpasses middle of eye. Both jaws with a band of equal, minute teeth. Mental barbel longer than eye. About 10 short, somewhat swollen gillrakers. First dorsal originates nearly half length of eye behind gillopening; connected at its base with second dorsal, which has anteriorly the same height; posteriorly its height increases, in the middle it equals about $2^1/_5$ the height of the body. Anal of similar length and behaviour. Ventrals inserted before base of pectorals, about one eyediameter before anus, their distance from one another $^2/_5$ length of head; their second and third ray prolonged to about last fourth of anal. Pectorals equal to head without snout. Caudal narrow, rounded and somewhat pointed; totally free from dorsal and anal. Scales small; 5 scales between first dorsal and lateral line, which is repeatedly interrupted and is wanting in the posterior part of the tail. In alcohol uniform brown; belly and branchiostegal membrane blackish; pectorals and ventrals hyalin, caudal nearly so, dorsal and anal especially towards their border blackish. Length 120 mm.

Habitat: Flores Sea, 247 M.!

3. Tripterophycis Boulenger.

(Boulenger, Descr. of a new Deep-sea Gadid fish from South Africa. Ann. Mag. Nat. Hist. (7) IX. 1902, p. 335; Marine Investigat. in South Africa II. 1904, p. 168).

Body elongate, compressed much attenuate posteriorly, with very short praeanal region, covered with small cycloid scales; lateral line present. Head short; eye large; nostrils close together, close to eye; snout short. Mouth moderate; a short mental barbel. Jaws with a single series of small, closely set, truncate, compressed teeth, none on vomer and palatines. Gillmembranes united anteriorly, free from isthmus; seven branchiostegal rays; pseudobranchiae wanting. Three dorsal fins, the first very small and on the nape, the second short and deep, behind the vertical of the vent, the third elongate and low, widely separated from the second and nearly reaching the caudal.

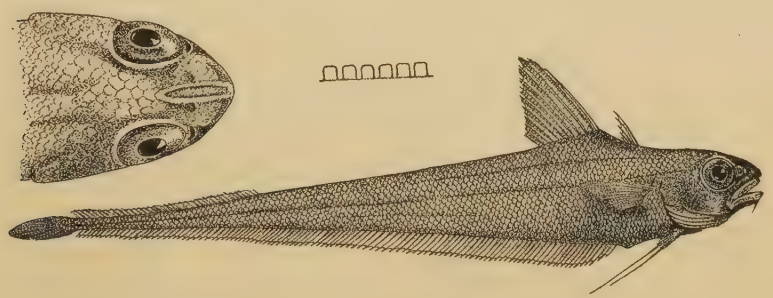

Fig. 4. *Tripterophycis gilchristi* Boul. After Boulenger. With upper view of head and enlarged view of mandibular teeth.

A single anal fin, measuring more than three fourths the total length. Caudal fin small, pointed, distinct from dorsal and anal. Ventrals reduced, with narrow base, composed of five rays, the two outer of which are prolonged and filamentous. [After Boulenger and Brauer].

Distribution: that of the single species known.

1. Tripterophycis gilchristi Boul. [Fig. 4, p. 11].

Tripterophycis Gilchristi Boulenger, Ann. Mag. Nat. Hist. (7) IX. 1902, p. 335 and Marine Investigat. South Africa II. 1904, p. 168.

Tripterophycis Gilchristi Brauer, Tiefsee-Fische, Deutsche Tiefsee-Exped. XV. 1906, p. 275.

B. 7; D^1. 4, D^2. 14, D^3. 36—38; A. about 110; P. 19; V. 5; L. l. 140.

Height slightly more than length of head, which goes 6.5 times in length. Eye twice in head; snout 5.5, blunt, slightly projecting; maxillary reaching to middle of eye. Ventrals before first dorsal, their outer filamentous ray surpasses origin of anal. Pectorals twice as long as eye. Anal begins immediately behind anus; its rays are subequal, with exception of the foremost part, and higher than those of the third dorsal. Second dorsal rather high, its second ray longer than head; third dorsal low. Caudal obtusely pointed. Immediately before anus a round, black margined suctorial disc-like organ, similar to that of Hymenocephalus. Colour in alcohol brownish, ventrally black; anal whitish, caudal, first dorsal and proximal part of pectorals blackish. Length 164 mm. [After BRAUER, not seen by us].

Habitat: Northwest coast of Sumatra, 296 M. — 40 miles off Table Mountain, Cape; 457 M.

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3. Fam. CORYPHAENOIDIDAE.

(*Macruridae* autt.).

Airbladder usually present, physoclistic. Head usually with more or les developed muciferous sensory canals and vacuities, most developed in the suborbital region and continued on the snout; according to this development the dermal bones get less firm and even paperthin. Body elongate, trunk short, tail long, tapering, strongly compressed, without separate caudal, the dorsal and anal long, confluent posteriorly; the dorsal with or without a separate anterior portion, the first two inarticulate rays of which may be transformed, the first into a rudimentary, the second into a generally prolonged spine. Pectorals with 3—6 pterygials. Ventrals below or somewhat behind the origin of the pectorals, with (6) 7—12 rays. Scales imbricate, cycloid, carinate or spiniferous; lateral line present. Mouth protractile, terminal, subterminal or inferior; in the latter case the snout is prominent by enlargement of the nasal bones, which unite in the middle line, and are supported below by the united praeorbitals. A mandibulary barbel generally present. Teeth in jaws usually small, in a single series

or in villiform bands, no teeth on palate [1]). Gillopenings wide, gillmembranes free from isthmus or narrowly joined to it. Pseudobranchiae present, reduced or absent. Six to eight branchiostegals. Four gills, the slit behind the last may be reduced. Gillrakers on first branchial arch more or less numerous, long setiform or reduced to scabrous tubercles.

The *Coryphaenoididae (Macruridae)* are benthonic fishes distributed over all oceans even in arctic and antarctic regions, but their principal abode are the depths of tropical and temperate seas where they live in depths from 70 to 4843 M. [2]). They are carnivorous and feet greatly on Crustacea.

Note. We confess, that subdividing the *Coryphaenoididae (Macruridae)* in a number of genera seems somewhat artificial; though to be recommended from a practical point of view on account of the great number of species. Their origin seems to be of comparatively recent geological date and to be derived from litoral forms. They are probably still in course of local development and no conspicuous breaks have yet been established by dying out of intermediate forms to separate them in more conspicuous groups.

In arranging them in genera and subgenera, we have greatly made use of the recent publication of GILBERT & HUBBS (U. S. Nat. Mus. Bull. 100, vol. I, 1920).

Key to the Subfamilies of Coryphaenoididae.

1. No membranous fold connecting the first gill-arch with the gill-chamber and restricting the gill-slit; gillrakers not tubercular; pseudobranchiae present or absent. Branchiostegals 7. Snout obtuse, not projecting beyond the large, terminal mouth. Teeth in villiform bands in jaws. Scales cycloid, unarmed. Second dorsal ray not modified and spinelike. One or usually two dorsal fins, the posterior higher than anal. Vent near origin of anal . . . . . *Bathygadinae* p. 14.

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1) The genus *Melanonus* Gthr. often united with the *Coryphaenoididae*, belongs to the *Gadidae* as it has a separate caudal, the ventrals situated before origin of pectorals and teeth on vomer, palatines and pterygoids.

2) BRAUER, Tiefseefische der Valdivia Expedition 1906, p. 339 has given an ampel discussion about the horizontal and vertical distribution of this family.

2. A membranous fold connecting the first gill-arch with the gill-chamber and restricting the gill-slit; gillrakers tubercular or spiny; no pseudobranchiae; branchiostegals 6 or 7. Snout little or greatly produced, mouth accordingly terminal, subterminal or usually inferior. Teeth in jaws only. Scales thin, smooth or usually spinous. Second dorsal ray a modified spine, often with serrations on its anterior edge. Anal better developed than second dorsal. Vent immediately before or remote from anal . . . . . *Coryphaenoidinae* p. 23. *(Macrurinae)*

1. Subfam. Bathygadinae.

Head broad and cavernous by sensory muciferous cavities, with the bones thin and soft, or only moderately broad and cavernous, with rather firm bones without prominent ridges or spiny armature. Body deep; tail sharply compressed, thin and tapering. Snout obtuse, not projecting beyond the large, terminal [1]), more or less oblique mouth, with the jaws nearly even in front. The mandible received within the intermaxillaries; both jaws provided with small villiform teeth, forming in cross-section a convex band; the intermaxillary one broader than the mandibulary band; vomer and palatines toothless. Tip of lower jaw with or without a barbel. Branchiostegals 7. Gillopenings wide, the gillmembranes slightly united in front and free from isthmus. Four gill-arches, with a slit of different extension behind the last and with numerous long gillrakers on the first arch, which has no membranous fold connecting it with the wall of the gillchamber and restricting the gill-slit. Pseudobranchiae present or absent. Operculum with a blunt spinelike prominence at its angle. Scales small, cycloid, deciduous, unarmed [2]); lateral line, more or less arched over the pectoral, suddenly dips downward to its position below the middle of the tail. Fins with or without filaments. First dorsal without differentiated spines, first ray rudimentary, second unarticulate, the others branched, as also the second dorsal which is many-rayed and higher than the many-rayed anal; no caudal. A pseudo-caudal may be present when the tip of the tail is broken as is often the case. Ventrals inserted below pectorals. The

1) Mouth inferior and snout produced in the pacific *Trachyrhynchus* Giorna.
2) Spinigerous in *Trachyrhynchus*.

position of the scapular foramen variable and of no generic value as it may perforate the scapula or lie between the scapula and the coracoid in closely related species. Vent near origin of anal. Size rarely surpassing 500 mm.

Distribution: In all tropical and temperate seas between abouth 65° N. and 40° S. in depths between 197 and 2744 M.

1. Bathygadus Günther.

(Günther, Challenger Reports XXII. Deep-sea fishes 1877, p. 154).
Melanobranchus and *Gadomus* Regan, Ann. Mag. Nat. Hist. (7) XI. 1903, p. 459.
Regania Jordan, Bull. U.S. Fish. Comm. (1902) 1904, p. 604 (p.p.).

For the characters of the single indo-australian genus see those of the family.

Distribution: In tropical and subtropical seas between about 32° N. and 32° S. in depths between 197 and 2744 M.

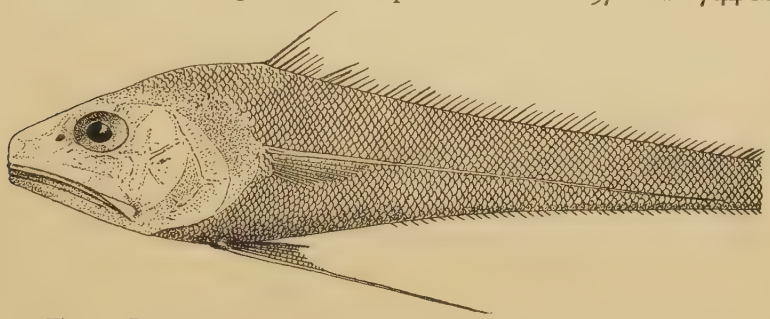

Fig. 5. *Bathygadus (Bathygadus) filamentosus* (Sm. & Radcl.) × 2/3.

Key to the subgenera of Bathygadus.

1. Barbel very short or absent; teeth comparatively coarse; interorbital space equal to or shorter than diameter of eye. *Bathygadus* p. 15.
2. Barbel very long; teeth minute; interorbital space longer than or at utmost as long as diameter of eye . . . . . *Gadomus* p. 20.

Subgenus Bathygadus Günther.

Barbel very short or absent; teeth comparatively coarse; interorbital space equal to or shorter than diameter of eye.

Key to the indo-australian species of the subgenus Bathygadus.

1. Second dorsal, second pectoral and outer ventral ray filamentous, much longer than head. Diameter

of eye 1.4 to 1.7 in interorbital width, which is contained 2.8 to 3 times in head. V. 8. . . . . *B. (B.) filamentosus* p. 16.

2. Fins without filamentous prolongations.

a. Diameter of eye 1.7 to 1.8 in interorbital width, which is contained slightly more than thrice in head. Six scales between second dorsal and lateral line. V. 8 to 9 . . . . . *B. (B.) spongiceps* p. 17.

b. Diameter of eye 1.1—1.3 in interorbital width, which is contained 3 7 to 4 times in head. Seven to 8 scales between second dorsal and lateral line.

α. Ten ventral rays. Interorbital width 3.7 in head. *B. (B.) entomelas* p. 18.

β. Eight to 9 ventral rays. Interorbital width 4 in head. . . . . *B. (B.) furvescens* p. 19.

1. Bathygadus (Bathygadus) filamentosus (Sm. & Radcl.). [Fig. 5, p. 15].

Regania filamentosa Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. vol. 43, 1912, p. 107.

Bathygadus dubiosus M. Weber, Siboga-Expedit., Fische, 1913, p. 173.

Bathygadus filamentosus M. Weber, Siboga-Expedit., Fische, 1913, p. 672.

Bathygadus filamentosus Gilbert & Hubbs, U. S. Nat. Mus. vol. I, Bull. 100, 1920, p. 384.

B. 7; D^1. 8—9; D^2. 104—107; A. 90; P. 13—14; V. 8.

Head cavernous, with the sensory canal system strongly developed; its bones soft, especially its suborbital part; rather broad, its greatest breadth slightly exceeding length of snout plus eye. Eye 4.2 to nearly 5 times in head; 1.3 to 1.5 in snout; 1.5 to 1.7 in interorbital space which goes 2.8 to 3 times in length of head. Snout blunt, nearly one third (3.1—3.2) of the length of head. Upper jaw 1.6 to 1.8 in head, reaching behind hindmargin of eye. No barbel. Interoperculum rounded; operculum superiorly with a keel terminating in a slender spine. Intermaxillary with a rather broad, mandibula with a narrow band of small, sharp teeth. A small slit behind fourth gill; about 20 long, slender gillrakers on lower part of first arch; no pseudobranchiae. Origin of dorsal over base of pectorals. Second dorsal, outer ventral and second pectoral ray filamentous and prolonged to about half total length. Anterior rays of second dorsal much higher than those of anal. Base of ventrals midway between tip of mandible and vent. Colour in alcohol yellowish or brown. Lining of buccal, branchial and

abdominal cavities black. Length of largest specimen known 242 mm. (a pseudocaudal developed).

Habitat: Arafura Sea 924 M.!; off east coast of North Borneo 758 M.; Molucco Passage 795 M.; Gulf of Boni 987 M.

2. **Bathygadus (Bathygadus) spongiceps** Gilb. & Hubbs.

Bathygadus spongiceps Gilbert & Hubbs, U. S. Nat. Mus. I. Bull. 100, 1920, p. 381.

B. 7; D[1]. II. 8—9; P. 15—19; V. 8—9.

Head broad and cavernous; its membrane-bones thin and papery. Dorsal contour arched behind the occiput, but concave from occiput forward to tip of intermaxillary spine, which enters conspicuously into the profile. Orbit contained five times in head, or 1.7 to 1.8 in the least interorbital width, which is as great as, or slightly greater than the length of the snout and is contained slightly more than three times in the head. The least width of the suborbital space is contained 1.3 to 1.5 times in the length of the orbit. Mouth large and oblique; the upper jaw extends to the vertical from the hindmargin of the orbit and is contained 1.8 to 1.9 times in head. The teeth are rather coarse and irregularly placed in the intermaxillary band, which is margined within by a definite, narrow, parallel-sided area of shagreen-like teeth, extending forward almost to the front of the intermaxillaries. No trace of mandibular barbel. Small inclosed pseudobranchiae present. Gill-rakers on first gillarch denticulate along their inner edges; the longest one 1.2 to 1.8 times in orbit, (5) — 6 + 19 — 22 in number. Branchial aperture continued forward almost to the vertical from the anterior orbital margin. Six scales between lateral line and front of second dorsal. Smooth second dorsal spine contained 1.6 times in head; the second pectoral and the outermost ventral rays are likewise scarcely strengthened or produced. Base of ventral anterior to base of pectoral, which is nearly in a line with the origin of the first dorsal. The distance between the center of the anus to the base of the outer ventral ray 1.6 to 1.8 times in the head. Pyloric caeca 16—21. Colour very dark, head belly and fins blackish. Lining of buccal cavity blackish; that of the branchial and abdominal cavities wholly black. Length 390 mm. [After GILBERT & HUBBS; not seen by us].

Habitat: Buton Strait, near Celebes, 1022 M.; near Darvel

Bay, Northeastern Borneo 1620 M. — China Sea 960 M.; off Southeast coast of Luzon 878 and 1033 M.

3. Bathygadus (Bathygadus) entomelas Gilb. & Hubbs.

Bathygadus entomelas Gilbert & Hubbs, U. S. Nat. Mus. I. Bull. 100, 1920, p. 386.

B. 7; D¹. II. 8; P. 17—18; V. 10.

Head, though wide and cavernous, is much narrower and less spongy than in other species; the dorsal contour, not strongly arched behind the occiput, is straight from that point forward to the tip of the snout. Eye 4 times in head, 1.1 in least interorbital width, which is equal to the length of the snout; interorbital 3.7 in head. The two limbs of the opercle end in very weak spines, the upper of which is flat, the lower slender. Mouth only moderately oblique. The upper jaw extends slightly beyond the vertical from the hind orbital margin, its length being contained 1.8 times in the head. The teeth, similar to those of *B. spongiceps*, are coarser than those of *B. furvescens*; the mandibular band, which is about one-third as wide as the premaxillary band, is composed of but two or three irregular rows of teeth; the premaxillary band as usual consists of two portions — an outer one, with rather small teeth, which become decidedly smaller posteriorly; and an inner, shagreen-like portion, which extends along the entire inner length of the band, becoming widest below the front half of the eye, where its width is 0.03 of the length to the anus; the band narrows abruptly on its posterior third. No trace can be detected of a mandibular barbel. The pseudobranchiae, which form a series one-fourth as long as the orbit, are located beside the usual conic pit. The slit behind the fourth gillarch is only half as long as the orbit. Branchiostegals, 7; gillrakers, 5 + 20 (left) or 5 + 21 (right), denticulate on their inner margins; the longest gillraker is half as long as the orbit. The branchial aperture is continued forward ventrally to a vertical crossing the orbit before the pupil. The scales are in eight series from the origin of the second dorsal to but not including the lateral line series; the scales are thin and cycloid; they are in two series on the mandible. The shoulder girdle is covered by a naked membrane beneath the opercles.

Neither the second dorsal spine nor any of the pectoral

rays are strengthened or produced. The outer ventral ray probably failed to reach the anus. The base of the ventral is but little anterior to the origin of the dorsal and the insertion of the pectoral. The colour in alcohol is light brown, becoming blackish on the belly and on the jaws and the gular and branchiostegal membranes. The ventral fins are blackish; all the other fins are dusky. The lining of the buccal cavity is blackish; that of the branchial and abdominal cavities wholly black; the walls of the stomach are black, but the intestines and the pyloric caeca are pale. Length of single female specimen known 220 mm. (a pseudocaudal developed). [After GILBERT & HUBBS, not seen by us].

Habitat: Molucco Passage, 795 M.

4. Bathygadus (Bathygadus) furvescens Alc.

Bathygadus furvescens Alcock, Journ. Asiat. Soc. Bengal 43, 1894, p. 128. — Illustr. Zoology of the Investigator, Fishes 1895, pl. 16, fig. 1.

Bathygadus furvescens Alcock, Descr. Cat. Indian Deep-Sea fishes 1899, p. 121.

Bathygadus melanobranchus Brauer, Tiefsee-Fische Valdivia Exped. 1906, p. 272 (nec VAILLANT).

Bathygadus melanobranchus M. Weber, Siboga-Exped., Fische, 1913, p. 172 (nec VAILLANT).

Bathygadus furvescens Gilbert & Hubbs, U. S. Nat. Mus. vol. I, Bull. 100, 1920, p. 388.

B. 7; D^1. II. 8—9; P. 15; V. 8.

Head and body compressed. Head about 5 times in length. Eye 4 to 5 in head according to length, 1.1 to 1.4 in the blunt snout and 1.2 to 1.3 in rounded interorbital space, which goes 3.4 to 3.5 in head. Snout in head 3.3 to 3.7; postorbital part about half length of head. Upper jaw 1.7 to 1.8 in length of head, it reaches to hindmargin of eye or nearly so far. Praeoperculum rounded, hindborder of operculum with two weak prominent spines. The intermaxillary band of teeth, has its inner portion narrow and shagreen-like. The mandibulary band is about half as wide. Gillrakers on first branchial arch 5 + 17 to 19, setiform. No mandibulary barbel. Scales thin and very deciduous, seven between lateral line and origin of second dorsal. First dorsal nearly not separated from the second, its first spine concealed, its second spine half length of head or somewhat more. Pectorals with the prolonged ray somewhat longer, their origin somewhat behind that of first dorsal. Origin of ventrals slightly before that of pectorals, their outer ray

about equal to postorbital part of head. Colour in alcohol uniform dark brown, fins, branchial and buccal cavities blackish. Length 520 mm.

Habitat: Northwest coast Sumatra; Strait of Makassar 1301 M.!; Flores sea 694 M.!; Ceram sea 567 M.!; Gulf of Tomini, Celebes 1399 M. — East coast of Luzon 1033 M.; between Leyte and Mindanao 1785 M.; between Siquijor and Bohol Islands about 1280 M.; Andaman sea 741 M.; Bay of Bengal 750 M.; Gulf of Manar 260—731 M.; Arabian sea 742, 878, 1315 M. East African Coast [BRAUER].

Note. *Bathygadus furvescens* Alc. is closely related to the atlantic *B. melanobranchus* Vaill. It differs by its conspicuously smaller eyes.

2. Subgenus **Gadomus** Regan.

Barbel very long; teeth minute; interorbital space longer than or at utmost as long as diameter of eye.

Key to the indo-australian species of the subgenus Gadomus.

1. Gular membrane light brown. Gillrakers 4—5 + 17—21 on first branchial arch; pyloric caeca 61—75. Interorbital space 1.5 to 1.8 in greatest orbital length. Seven to 8 scales between lateral line and origin of second dorsal. Intermaxillary band of teeth 1.25 to 1.65 in least suborbital width. . . . *B. (G.) denticulatus* p. 21.
2. Gular membrane black.
   a. Gillrakers (4) 5—6 + 20—24, rather short, bluntly tipped; pyloric caeca 35—52. Interorbital space 1.0 to 1.23 in eye. Seven scales between lateral line and origin of second dorsal. Teeth fine, their intermaxillary band 2.2 to 3.0 in least suborbital width . . . . . *B. (G.) introniger* p. 21.
   b. Gillrakers 6—7 + 25—30, long, sharply tipped; pyloric caeca 12—22. Interorbital space about as wide as the eye. Six scales between lateral line and origin of second dorsal. Teeth coarser, their intermaxillary band 3.3 to 3.8 in least interorbital width . . . . . *B. (G.) multifilis* p. 23.

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INVESTIGATIONS

1. Bathygadus (Gadomus) denticulatus Gilb. & Hubbs.

Bathygadus longifilis M. Weber, Siboga-Exped., Fische, 1913, p. 173 (nec *Bathygadus longifilis* Goode & Bean).

Gadomus denticulatus Gilbert & Hubbs, U. S. Nat. Mus. I. Bull. 100, 1920, p. 393.

B. 7; D¹. II. 9—10; P. 18—20; V. 8.

Head comparatively firm and only moderately cavernous; its greatest width about equal to snout plus eye. Eye nearly round, about 4.3 in head and 1.1 to 1.3 in snout. Interorbital space flat, its least width 1.1 to 1.7 in eye and less than one half the length of the snout. The two limbs of the opercles do not end in spines. Mouth moderately oblique; upper jaw 1.8 to 1.9 times in head, extends but slightly beyond vertical through posterior margin of orbit. Teeth excessively fine and crowded, in strongly convex bands, the mandibulary band only one third as wide as the intermaxillary one, the greatest width of which is contained 1.25 to 1.65 in the least suborbital width. Barbel conspicuously shorter than eye. Gillrakers 4—5 + 17—26. A narrow slit behind fourth gillarch. Scales cycloid, thin, deciduous; 7—8 between lateral line and origin of second dorsal. Origin of first dorsal almost on a vertical with the insertions of pectorals and ventrals. First dorsal spine concealed, second dorsal spine two-thirds to three-fourths as long as the distance from snout to anus; the second pectoral ray lengthened into a slender filament, is 1.4 times that length. The distance between the anus and the base of ventrals more than two-thirds the length of the head. Outer ventral ray less than twice as long as head. Pyloric caeca short, 61 to 75. Colour in alcohol, lighter or darker brown, lighter below and with silvery reflections on lateral and ventral surfaces of head and trunk. Branchiostegal membranes dark brown, gular membranes lighter, lower lip white. Dorsal black; anal shading into black posteriorly. Length to end of small pseudocaudal 307 mm.

Habitat: Off east coast of North Borneo 475 and 759 M.; between Halmahera and Makian Islands 526 M.; Savu Sea 959 M.!; Flores Sea 694 M.!.

2. Bathygadus (Gadomus) intron iger Gilb. & Hubbs.

Gadomus multifilis Radcliffe, Proc. U. S. Nat. Mus. vol. 43, 1912, p. 106 (nec *Bathygadus multifilis* Günther).

Gadomus intron iger Gilbert & Hubbs, U.S. Nat. Mus. vol. I, Bull. 100, 1920, p. 401.

B. 7; D¹. II. 9—10; P. 17—20; V. 8.

Greatest depth, below the origin of the first dorsal, is about equal to the distance from the tip of the snout to the praeopercular ridge at its angle. Greatest orbital width 4.5 to 4.7 times in the length of the head and 1.15 to 1.25 times in length of snout. Interorbital almost as wide as orbit, and about twice as wide as suborbital. Upper jaw, which is contained 1.7 to 1.8 in head, extends well beyond eye. The teeth forming the bands are aligned in a single series separated by narrow toothless streaks. The greatest width of the intermaxillary band is contained 2.2 to 3 times in the least width of the suborbital. Mental barbel long and slender, but of extreme variability, its length ranging from half that of the eye to two-thirds that of the head. Gillrakers, slightly roughened on their inner edge, are bluntly tipped, rather widely spaced, and are short, being about as long as the least suborbital width in the adults, but relatively a little longer in the young; they number 5—6 + 20—24. Seven scales between lateral line and origin of second dorsal. Second dorsal spine greatly produced, its length about a half longer than that of the head. Length of second pectoral ray varies greatly, from less than three-fourths to one and a half times the length to anus. Length of outer ventral ray never approaches twice that of the head, but is always longer than head. The first dorsal, pectoral and ventral fins begin on about the same vertical. The distance between anus and base of outer ventral ray is contained about 1.5 times in head. Pyloric caeca 35 to 52. Colour dark brown, a little darker on the belly, and blackish on the snout, mandible, and sides of head. The buccal, branchial and peritoneal cavities are wholly lined with black, without white margin. First dorsal light throughout; the second has a narrow light streak near its base, otherwise dusky; anal dusky. The dusky pectoral becomes lighter toward the tip of the filamentous ray and blackish near its base. The blackish ventral becomes lighter toward the inner margin of its base. Length 334 mm. [After GILBERT & HUBBS; not seen by us].

Habitat: East coast of North Borneo 635 and 870 M.; Buton Strait 949 M.; Gulf of Boni 885 and 1280 M. — China Sea, off southern Luzon 960 M.; Lagony Gulf, eastern Luzon 549 M.

3. Bathygadus (Gadomus) multifilis Gthr.

Bathygadus multifilis Günther, Challenger Reports XXII. Deep-Sea fishes, 1887, p. 155.

Bathygadus longifilis Alcock, Descr. Cat. Indian Deep-sea fishes 1899, p. 120 (not synonymy).

Bathygadus longifilis Brauer, Tiefsee-Fische I. Valdivia-Expedition 1906, p. 270 (not synonymy).

Gadomus multifilis Gilbert & Hubbs, U. S. Nat. Mus. I, Bull. 100, 1920, p. 406 (p.p.).

B. 7; D^1. II. 7—9; P. 15—17; V. 8.

Head soft and spongy, due to the spaciousness of the sensory canals. Eye 4.2 to 4.6 in head, 1.2 in snout and about equal to interorbital space. Upper jaw 1.6 to 1.7 in head, extending well beyond orbit. Teeth coarser, in very narrow bands; the greatest width of the intermaxillary series being contained from 3.3 to 3.8 times in the least suborbital width. Gillrakers long, sharp, crowded, strongly compressed, and rough on their inner and outer edge, 6—7 + 25—30 on first branchial arch. Small pseudobranchiae present. Barbel slender, half length of head or more. Six scales, exclusive of the lateral line scale, between lateral line and origin of second dorsal. On the trunk the lateral line runs above the middle of the sides, but descends on the tail to a position below the middle of the depth. Second dorsal ray and first pectoral and ventral ray twice as long as head or longer. Distance between anus and base of ventrals longer than half length of head. Pyloric caeca 12—22. Colour in alcohol brown, darker on belly; opercular, gular and branchiostegal membranes, jaws and lining of mouth black; fins blackish. Length 330 mm. [Type of GÜNTHER in the British Museum seen by us].

Habitat: West coast Sumatra 903 M.; Vicinity of Darvel Bay, Borneo 1628 M.; Gulf of Tomini, Celebes 1227 M. — Near Philippine Islands 839—1313 M., Bay of Bengal, Andamans, near Laccadives, Arabian Sea, East African coast (BRAUER).

2. Subfam. Coryphaenoidinae.

(Macrurinae).

Body slender, even fragile or more robust; head compressed or conical, sometimes shortened or excessively enlarged. Its bones firm or forming a delicate framework to comprise the sensory canals, which may be excessively developed and modified into wide shallow cavities, covered over by membranes, which are delicate and scaleless or more firm and

scaled. Suborbital ridge strongly prominent and extending to preopercle or only slightly marked and reaching not so far. Rostral, supraorbital and occipital ridges, which may be covered by modified scales, strongly pronounced or wanting. Snout with a nearly vertical anterior profile and only slightly projecting or greatly produced beyond frontborder of mouth. Mouth large or small, terminal or inferior, the lower jaw included, at its tip a barbel or none. Teeth in jaws only, varying from a single series in the mandible to a narrow or wide villiform band, which usually covers the jaws, the outer series often enlarged. Gillmembranes broadly united with a posterior free fold, or the gillopening wide, the gillmembranes narrowly joined, more or less attached to isthmus. Four gill-arches with a slit behind the last and tubercular spiny or reduced gill-rakers; 6 to 7 branchiostegal rays. A membranous fold connecting the first gill-arch with the gill-chamber and restricting the gill-slit. Scales usually imbricate, or irregularly arranged on body; they may be reduced or even wanting on head and are often very deciduous; smooth or usually covered by spinules, their roughness and mode of arrangement showing wide variation. Lateral line more or less conspicuous, sometimes modified. Lens-shaped organs, one before anus, the other in advance of ventrals, and a ventral area with modified striated skin may be present, as also a scaleless area before or round anus and a scaleless fossa between ventrals may be present. Anus immediately before or remote from anal. Second dorsal spine smooth, or weakly spined or strongly serrated, its anterior edge rounded or trenchant. Ventrals inserted below or before pectorals. Anal better developed than second dorsal; no caudal, a pseudocaudal may be developed when the tip of the caudal was broken.

Distribution: Bathybial fishes inhabiting the temperate and tropical seas even extending into glacial seas, in depths from 78 to 4846 M.

Key to the indo-australian Genera of Coryphaenoidinae.

(Macrurinae).

I. Six branchiostegal rays. Gillmembranes broadly united, attached to isthmus, usually with a posterior free fold. Gillrakers less than 15 rudimentary scabrous tubercles on lower limb of first branchial arch. Mandibulary

barbel present. Anal much higher than second dorsal. No ventral striae. Scales imbricate, carinate or spiniferous at least in adult. Anus usually close to or remote from anal.

1. Snout slightly or not produced. Head without strongly marked ridges, the suborbital ridge not extending to preopercle and not angulated. Anterior edge of dorsal spine trenchant and more or less serrate. Intermaxillary teeth in a villiform or cardiform band, mandibulary teeth varying from a single series to a band. Anus not preceded by a naked area or fossa. Usually over 500 mm. length. *Coryphaenoides* p. 26.
2. Snout greatly produced. Head with prominent ridges, armed with modified scales. Suborbital ridge extending to preopercle and strongly angulated. Second dorsal spine rounded anteriorly and smooth. Teeth in jaws in villiform bands . . . . . *Coelorhynchus* p. 36.

II. Seven branchiostegal rays. Branchial aperture extended forward to below hindmargin of eye; gillmembranes therefore narrowly united and free from isthmus. Gillrakers 18 to 12 spines on lower limb of first branchial arch, they may be reduced to tubercles. Mouth large, subterminal. Barbel present or absent. Sensory canals of head greatly developed, separated by delicate bones and roofed over by scaleless membranes. Scales very caducous, thin, round, with or without weak spinules. Two ventral lens-shaped organs. Parallel striae on abdomen. Narrow bands of minute teeth in jaws. Anus immediately before anal. Second dorsal spine smoothor weakly denticulated . . . . . *Hymenocephalus* p. 55.

III. Seven branchiostegal rays, by exception only 6 or 6 to 7. Gillrakers on lower limb of first arch less than 15. Anus remote from anal, surrounded or preceded by a naked area. Ventral region without striation. Scales spinulated.

A. Mouth large, subterminal; upper jaw less than 3 times in length of head. Gillmembranes unite below orbit.

1. Intermaxillary teeth biserial, mandibulary uniserial. Second dorsal spine smooth and rounded. *Malacocephalus* p. 61.
2. Teeth in jaws in narrow villiform bands. Second dorsal spine more or less serrate, the anterior edge trenchant. . . . . *Ventrifossa* p. 64.

B. Mouth small or moderate. Upper jaw 3 or more than 3 times in length of head. Gillmembranes unite below ridge of preopercle (except some aberrant species of *Lionurus*). Teeth in villiform bands.

1. No series of enlarged and modified scales along base of second dorsal. Bones of head firm, sensory canals moderately developed. Scales everywhere imbricate. Second dorsal spine trenchant and serrate.

a. Snout short, conical or only slightly produced beyond frontborder of mouth, its lateral margin not angulated . . . . . *Lionurus* p. 70.

b. Snout greatly produced, its underside flat and straight, its lateral margins with a pronounced angle in front of the nostrils, bearing a bony prominence or a bunch of spines, 6—7 branchiostegal rays . . . . . *Mataeocephalus* p. 79.

2. Enlarged and modified scales only along anterior portion of second dorsal and anal. Head normal, its bones firm, the sensory canals moderately developed. Scales not imbricate, diamond-shaped. Second dorsal spine smooth and rounded. Snout subconic, slightly projecting . . . . . *Trachonurus* p. 82.

3. Enlarged and modified scales along total base of second dorsal and anterior part of anal. Head greatly enlarged, its bones soft, the sensory canals greatly developed. Scales small, in rather irregular series on body, nonimbricate on head. Second dorsal spine serrate, the anterior edge trenchant. Snout triangular, scarcely projecting . . . . . *Cetonurus* p. 84.

1. Coryphaenoides Gunner.

(Gunner, Trondhjem Selskab. Skrifter III. 1765, p. 50).
Macrourus Bloch, Naturgesch. Ausländ. Fische II, 1786, p. 150.
Macrurus Bloch, Schneider, Syst. Ichthyol. 1801, p. 103.
Macrurus Günther, Cat. Brit. Mus. IV. 1862, p. 390 (p.p.) and Challenger Reports XXII. Deep-sea fishes 1887, p. 130 (p.p.).

Head large without strongly marked ridges, the more or less pronounced suborbital ridge not extending to praeoperculum. Snout slightly or not produced, combined with a small or only moderately large and inferior mouth, or a large and subterminal one. Teeth in both jaws in villiform bands, the outer series in the intermaxillary band often enlarged. In the

lower jaw the band may be reduced to a single series, which is combined with a large, subterminal mouth. No teeth on vomer, palatines and pterygoids. Six branchiostegal rays. Gill-openings wide; gillmembranes broadly united in front, adnate to isthmus, with a posterior free fold. Gillrakers on lower limb of first branchial arch less than 15 rudimentary scabrous tubercles. Mandibulary barbel rather small or wanting.

Anus close to or remote from origin of anal. First dorsal fin with the first spine rudimentary; the second spine often more or less prolonged, trenchant and more or less serrate. Second dorsal many rayed, lower than many rayed anal. Ventrals with 8—10 rays, the outer ray usually prolonged; their origin below or somewhat behind that of pectorals, which

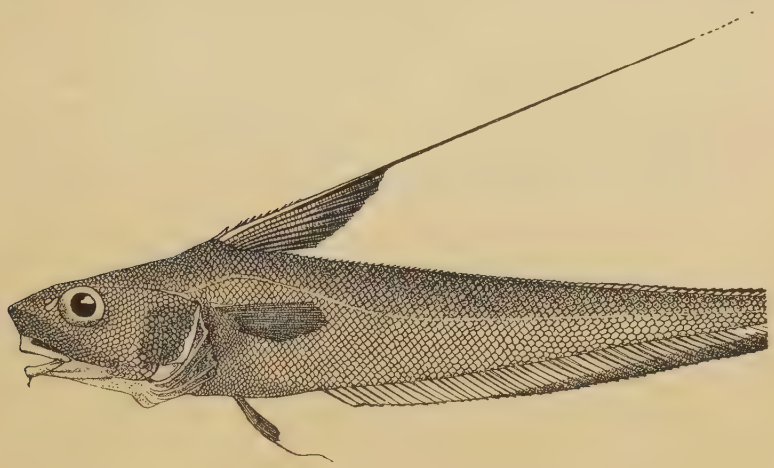

Fig. 6. *Coryphaenoides tydemani* (M. Web.). × 2/3.

have 12 to 22 rays. Ventrals and pectorals below first dorsal. Scales of small size, cycloid in youth, later on carinate or spiniferous in their exposed part. Lateral line slightly arched or nearly straight above pectoral, running down to middle of tail and continued to its end. For other characters see those of the family. Size usually far below 500 mm.

Distribution: In all oceans in depths from 180 to 3500 M.

Note. We suppose that GARMAN (Mem. Mus. Compar. Zool. Harvard Coll. XXIV, 1899, p. 194) was the first to state that *Coryphaenoides* Gunner (1765) takes precedence over *Macrourus* Bloch (1786), after STEINDACHNER & DÖDERLEIN

(Denkschr. Akad. Wien LIV, 1887, p. 23) had expressed their opinion, that *Coryphaenoides* Gunner, ought to be regarded as a subgenus of *Macrourus* Bloch.

Key to the indo-australian species of Coryphaenoides.

I. Suborbital ridge wanting, space between eye and mouth therefore vertical, without angulation. No barbel. Pectorals with only 12 rays. Scales nearly smooth. . *C. sibogae* p. 29.

II. Suborbital ridge more or less pronounced, dividing the space between eye and mouth through an angulation in a larger more or less vertical and a smaller deflected space. Mandibular barbel developed. Pectorals with 14—22 rays. Scales only in youth nearly smooth, later spiniferous.

A. Anus close to origin of anal.

1. Diameter of eye 3.6—3.8 in head; longer than interorbital space . . . . . *C. aequatoris* p. 30.

2. Diameter of eye 4—5 in head, shorter than interorbital space.

a. 8 scales between origin of second dorsal and lateral line; spinules on scales aligned in about 15 series, converging to apex of scale. *C. tydemani* p. 31.

b. 5—6 scales between origin of second dorsal and lateral line.

α. Scales with reduced number of slender spinules in about 5 parallel rows; suborbital ridge strongly developed. . . . . *C. orthogrammus* p. 32.

β. Spinules rather strong, in about 13 subparallel rows, on some of the scales somewhat divergent; suborbital ridge not much pronounced . . . . . *C. asprellus* p. 33.

B. Anus half diameter of eye or more in advance of origin of anal.

1. Origin of second dorsal and that of anal opposite; interdorsal space slightly less than diameter of eye. . . . . *C. hyostomus* p. 33.

2. Origin of second dorsal opposite to about 10th ray of anal; interdorsal space much more than diameter of eye . . . . . *C. heyningeni* p. 34.

Note. As the top of the prolonged dorsal, pectoral and ventral rays is often broken, there is taken no notice of them

in our key. In our diagnoses is also neglected the length of head compared with the total length while the end of the tail is often broken. For the same reason the number of rays of the second dorsal and anal is not counted.

The armature of the scales depends for a good deal on the age of the individual fish. Already GÜNTHER says of „*Macrurus*" in general:

„With regard to the scales, there is also every gradation from the small-scaled *Malacocephali* to the large-scaled *Macrurus longibarbis*. In very young specimens of all species the scales formed at first are always thin, without any armature, in fact cycloid. Spines appear only after some time, generally in the median line of the scale, singly and not in series; scales with fully developed armature are generally not found in specimens under 8 inches in length. In some species which normally possess strongly spiniferous scales, individuals may occur (especially such whose skin is wanting in pigment), in which the spines are much more feeble and scarcely visible. And finally, there are species in which the cycloid structure of the scales remains normally persistent. Thus, neither the size nor the structure of the scales can be safely used as a generic character."

Later authors have confirmed this view and shown, that the number and length of the spinules increase with age, and that their definite arrangement is only reached in nearly full-grown specimens.

1. Coryphaenoides sibogae n. sp.

Coryphaenoides spec., M. Weber, Siboga-Expeditie, Fische, 1913, p. 154.
Coryphaenoides spec., Gilbert & Hubbs, U. S. Nat. Mus. vol. I, Bull. 100, 1920, p. 422.

B. ?; D^1. 10; P. 12; V. 8 (?).

Head strongly cavernous, without any trace of a suborbital ridge; the space between eye and mouth is therefore vertical and measures about two third of the diameter of the eye. Eye 3.5 times in head, twice in its postorbital part and slightly less than length of the bluntly rounded snout, which surpasses the frontborder of the mouth. Interorbital space about equal to diameter of eye and more than thrice in length of head. Mouth lateral, subinferior; upper jaw nearly twice in length of head, reaching behind hindmargin of eye. No barbel visible. Jaws with numerous, small, equal teeth. First branchial

arch with about 10 gillrakers forming partly rudimentary scabrous tubercles. First dorsal inserted before that of pectoral; its second spinelike ray (the point of which is broken) carries about 20 conspicuous, evenly distanced, vertically directed spines. Head and body covered with equally small, nearly smooth scales; they are rounded and are armed with a median series of 2 to 4, generally 3 blunt, low tubercles; it may be accompanied on both or only on one side by a lateral series of equal tubercles. Colour in alcohol brown, lighter toward tail, darker on underside of head and belly. Length of mutilated and laterally compressed single specimen known 180 mm. (tail broken).

Habitat: Flores Sea 694 M!.

2. **Coryphaenoides aequatoris** (Smith & Radcl.).

Macrourus aequatoris Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 120.

Coryphaenoides aequatoris Gilbert & Hubbs, U. S. Nat. Mus. vol. I. Bull. 100, 1920, p. 419.

B. 6; D^1. II. 11; D^2. 60; A. 70; P. 22; V. 9.

Head deeper than wide; suborbital ridges and rostral edges moderately prominent. Eye 3.62; interorbital space 4.2 in head, flattened, slightly narrower than eye. Snout evenly rounded at tip, 3.6 to 3.8 in head, its tip projecting beyond mouth, which is small, broader than long, not extending backward beyond vertical from middle of eye; length of upper jaw 3.3 in head. Mandibular barbel equal to 0.5 diameter of eye. Teeth small, subconical, in villiform bands, outer row of teeth in the upper jaw considerably longer than the others. Scales large, 5 between the lateral line series and origin of first dorsal; each scale armed with rather widely separated spinules, the tips projecting considerably beyond margin of scale, these are arranged in horizontal rows; those projecting beyond margin of scale are somewhat flattened spearshaped; those on head smaller, standing more at right angles to body. Second dorsal spine about 1.4 in head, armed with long slender spinules; interdorsal space about two-ninths as long as head; second dorsal low, feebly developed; anal better developed, its origin from tip of snout 2.85 in total length. Ventrals small, outer ray filamentous, as long as head, their insertion well behind pectorals, directly below origin of first dorsal. The distance

between their insertion and the center of anus very short, being about equal to length of snout, and shorter than distance between ventral base and isthmus; pectoral 1.90 in head. Colour in alcohol: tail and upper part of trunk chocolate, top and sides of head hair-brown, lower sides of head and trunk dark seal-brown, fins dusky. The buccal cavity is lined with dusky, but is lighter behind the corners of the mouth; the branchial and abdominal cavities are lined with bluish black. Length 188 mm., a small pseudo-caudal developed. [After SMITH & RADCLIFFE and GILBERT & HUBBS, not seen by us].

Habitat: Gulf of Tomini, Celebes 1991 and 1997 M.

3. **Coryphaenoides tydemani** (M. Web.). [Fig. 6, p. 27].

Macrurus tydemani M. Weber, Siboga-Expeditie, Fische, 1913, p. 158.
Coryphaenoides tydemani Gilbert & Hubbs, U. S. Nat. Mus. I. Bull. 100, 1920, p. 414.

? B. 6; D^1. II 8—9; A. 63—70; P. 19—22; V. 8—9.

Profile of head above and behind eyes slightly concave, then strongly rising to origin of first dorsal; snout blunt, not much projecting, its preoral projection about equal to space below suborbital ridge, which is strongly pronounced. Head half as wide as long. Diameter of eye 4 to 5 in head, 1.3 to 1.4 in snout, which goes 3—4 times in head. Diameter of eye slightly larger than least interorbital width which is contained 4.1 to 5.5 times in head. Mouth small, inferior, slightly oblique; length of upper jaw about 3.3 in head, reaching vertical through center of eye. Teeth in both jaws in villiform bands of moderate breadth, those in the outer series of the intermaxillary band somewhat stronger and more widely spaced. Mandibulary barbel small, about one third diameter of eye. Scales on belly minute, on head smaller than on body, where their spinules are arranged in 12 to 16 series converging towards apex of scale; in young specimens of 100 mm. or less, the scales are still smooth or nearly so. There are 7 scales between dorsal spine and lateral line, 6 below last ray of first dorsal and 8 below origin of second dorsal, the lateral line scales excluded. The second dorsal spine is twice or thrice as long as head, its basal part is anteriorly keeled and provided with 11—12 denticulations of moderate strength. Pectorals more than half length of head, pointed in the middle; their origin below that of first dorsal. Ventrals inserted somewhat

behind that of pectorals, their filamentous outer ray about one fourth shorter than head. Anus immediately in advance of the anal. Colour in alcohol lighter or darker brown, darker on opercles and snout, margin of mouth and the branchiostegal membrane blackish as also the fins, the bases of which are usually lighter. Length 369 mm.

Habitat: Bali Sea 1018 M.!, Flores Sea 538 M., 694 M., 1310 M.!; Ceram Sea 924 M.!, Arafura Sea 560 M.!, Buton Strait, near Celebes, 1022 M.

4. Coryphaenoides orthogrammus (Smith & Radcl.).

Macrourus orthogrammus Smith & Radcliffe, in Radcliffe, Proc. U.S. Nat. Mus. vol. XLIII. 1912, p. 123.

Coryphaenoides orthogrammus Gilbert & Hubbs, U. S. Nat. Mus. vol. I, Bull. 100. 1920, p. 421.

B. 6; D¹. II. 11; P. 22; V. 10.

Head 5.12 in total length, arched, depressed anteriorly, breadth 2.18 in length; suborbital ridge sharp wavy; sides of the head are parallel, not diverging posteriorly, the distance between the lateral terminal tubercles is equal to the interorbital width. Body rather slender, strongly compressed, greatest depth at origin of dorsal 7.20 in total length; vent immediately in front of anal. Eye 4 in head, subcircular; interorbital space flat 3.4 in head, broader than eye; snout 3.18, short, depressed, a distinct angulation on sides as in species of *Metaeocephalus*; from this point the snout narrows rapidly, the margin being slightly concave, tip pointed. Mouth rather large, length of upper jaw 3.3 in head. Mandibular barbel small. Teeth in narrow villiform bands, outer row in upper jaw slightly enlarged. Scales of moderate size, 7 between origin of first dorsal, 5 between origin of second dorsal and lateral line series; exposed portion of each scale armed with about 5 parallel longitudinal rows of slender spinules, usually a single spine in each outside row, 2 in each of the next and 3 in the median row; those on head erect, hair-like, giving the head a furry appearance; underside of head partially scaled posteriorly. The ventral fin is inserted directly below origin of first dorsal and base of pectoral, at a distance from the center of the anus equal to the interorbital width, and at a distance from the isthmus equal to the length of the snout. Colour in alcohol: brown, head and belly darker; fins dusky; the lining of the buccal

cavity is dusky, of the branchial cavity bluish black. Length of single specimen known 180 mm. [After SMITH & RADCLIFFE and GILBERT & HUBBS, not seen by us].

Habitat: Near Gomomo Island, Pitt Passage 2308 M.

5. **Coryphaenoides asprellus** (Smith & Radcl.).

Macrourus asprellus Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 118.

Coryphaenoides asprellus Gilbert & Hubbs, U. S. Nat. Mus. I. 1920, Bull. 100, p. 410.

B. 6; D^1. II. 9; D^2. 71; A. 70; P. 20; V. lost.

Head with the bones not very firm, its surface broad and flat, subrectangular in transverse section, its breadth 2.04 in its length, less than its depth at middle of eye; suborbital ridges not much pronounced. Eye 4.18 in head, 1.16 in snout; interorbital space flat, depressed, 3.6 in length of head, equal to length of snout, which is blunt, overhanging mouth for a distance about 0.33 diameter of eye. Mouth large, inferior, maxillary 3.1 in head, barely reaching vertical through middle of eye. Teeth long, slender, cardiform, those in outer row of upper jaw slightly enlarged. Scales large, regular, somewhat deciduous, very rough, 6 in a series from second dorsal spine to and including lateral line, 5 from last dorsal ray (5—6 between origin of second dorsal and lateral line scale) [1]), exposed portion of each scale armed with about 13 subparallel rows of rather strong spinules [1]), those in median row slightly larger than the others; spinules of scales of head more nearly erect, the rows on some of the scales somewhat divergent; lateral line distinct, with a long, low arch anteriorly. Vent close to origin of anal. Colour in alcohol hair brown; fins dusky black; scattered black spots on under side of snout and sides of head. Length of single specimen known 413 mm. [After SMITH & RADCLIFFE, not seen by us].

Habitat: Southeast of Batjan Island, 1545 M.

6. **Coryphaenoides hyostomus** (Smith & Radcl.).

Macrourus hyostomus Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. vol. XLIII. 1912, p. 121.

Coryphaenoides hyostomus Gilbert & Hubbs, U. S. Nat. Mus. vol. I. Bull. 100, 1920, p. 422.

1) According to GILBERT & HUBBS l. s. c.; after these authors "the spinules of the scales are in quincunx order, and not in rows as originally described".

B. 6; D^1. II. 9; D^2. 90; A. 101; P. 17—20; V. 8.

Head short, broad, firm, little elevated posteriorly; suborbital ridge quite distinct, extending backward beyond orbit, but not to preopercle; its total length equal to that of mandible. Body slender, little compressed; slightly arched, the greatest depth at origin of dorsal. Anus well in advance of anal, slightly nearer insertion of anal than base of inner ventral rays. Eye 4.5 in head, 1.46 in snout, nearly as wide as interorbital, which is broad, flat, 4.2 in head. Snout 3.10 in head, pointed, depressed, its tip armed with short but robust spinules, above level of middle of eye and at a distance from mouth slightly greater than diameter of eye. Mouth U-shaped, longer than broad, lips fleshy; upper jaw 3.28 in head. Mandibular barbel small, slender, equal to diameter of pupil. Teeth cardiform, incurved, outer row in upper jaw slightly enlarged. Scales large, 5 or 6 rows between origin of second dorsal and lateral line series; exposed portion of scale armed with long, slender, needle-like spinules, the outer row extending for a considerable distance beyond margin of scale; underside of head naked; lateral line conspicuous, little arched anteriorly. Second dorsal spine with 3—5 indistinct or small serrations on anterior edge of its basal portion, long, filiform, 2.33 in total length. Interdorsal space slightly less than diameter of eye; anterior rays of second dorsal small but distinct. Origin of anal under insertion of second dorsal, its rays somewhat longer than those of the dorsal; outer ventral ray 1.69 in head, tip filamentous, reaching base of sixth anal ray, pectoral 1.73 in head. Colour in alcohol, dorsal surface marsbrown, somewhat lighter below lateral line; region below pectorals blackish; head anteriorly whitish gray. Length 280 mm. [After SMITH & RADCLIFFE, GILBERT and HUBBS, not seen by us].

Habitat: Near Sibuku Bay, Borneo 759 M.; Buton Strait, Celebes 1022 M. — Off coast of Luzon 878 to 1033 M.

7. **Coryphaenoides heyningeni** (M. Web.). [Fig. 7, p. 35].

Macrurus Heyningenii M. Weber, Siboga-Exped., Fische, 1913, p. 156.

B. 6; D^1. 13; A. ca. 120; P. 14; V. 8.

Head with the dorsal profile nearly straight and flat, 6 in length, height slightly less. Longest diameter of eye 3.4 in head, nearly equal to snout, which goes 3.1 in head and is

bluntly pointed by three low very scabrous prominences. The rounded suborbital ridges pronounced by the strong declivity of the space between them and the oral border. Interorbital space flat, 4.2 in head, nearly one fourth shorter than eye. Mouth small, inferior, the upper jaw reaching posterior third of eye. Mandibulary barbel shorter than eye. Jaws with bands of villiform teeth; the outer series of the intermaxillary band strongly enlarged and curved. Posterior border of praeoperculum straight with slightly prominent, rounded corner; hindborder of operculum twice superficially sinuated. Scales smaller on head, provided with about 50 sharp spinules, obscurely serially arranged. Number of scales between scales of lateral line and dorsal spine 6, between lateral line and end of first dorsal about 5, between lateral line and origin of second dorsal 7. Second spine of dorsal somewhat longer than head, its basal part with 17 sharp, distanced spines, its end filiform. Space between first and second dorsal about as long as

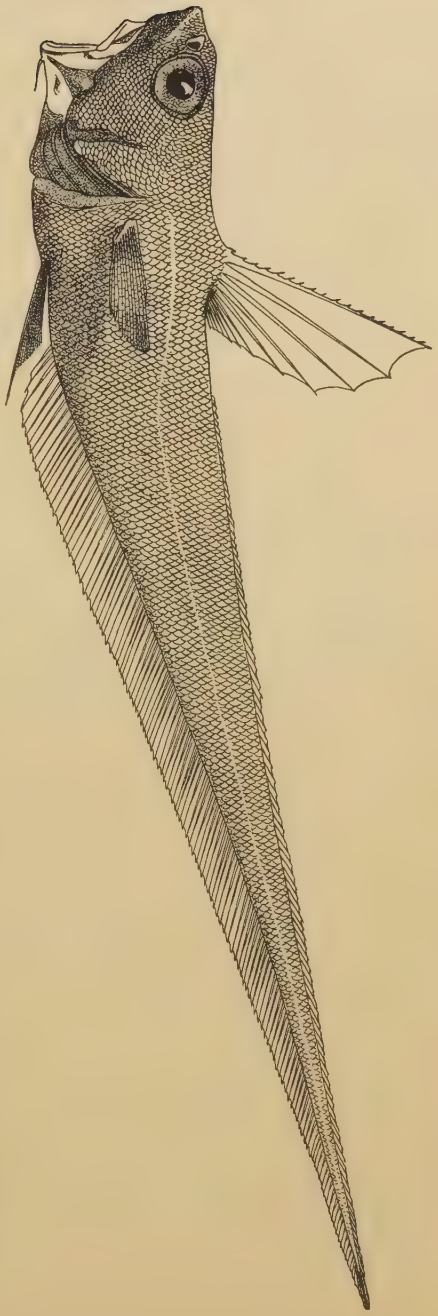

Fig. 7.
Coryphaenoides heyningeni (M. Web.). × 3/4.

postorbital part of head. Origin of second dorsal behind that of anal, the rays of which are rather high. Outer filiform ray of ventrals reaching about 7th anal ray. Origin of ventrals opposite to second dorsal spine. Pectorals situated before that vertical, about as long as head without snout. Anus between ventrals, half diameter of eye before origin of anal. Colour in alcohol uniform coffeebrown, belly and branchiostegals and gillmembranes blackish. Length of single specimen known 235 mm.

Habitat: Timor Sea, 918 M.!

2. Coelorhynchus Giorna.

(Giorna, Mem. Accad. Imp. Torino XVI. 1803, p. 178).
Coelorhynchus (subgenus) Günther, Deep-sea fishes, Challenger Report XXII. 1887, p. 124.
Paramacrurus and *Oxymacrurus* Bleeker, Versl. Akad. Wetensch. Amsterdam (2) VIII. 1874, p. 370 [1]).

Head large with projecting snout and with strongly marked ridges, covered with modified scales. The prominent suborbital ridge is continued from the tip of the snout to the praeoperculum, forms a prominent angle on the side of the head and divides the suborbital region into a superior vertical and an inferior subhorizontal portion. Mouth U-shaped, inferior. Teeth in both jaws in villiform bands or in the lower jaw biserial or nearly so, at least on the sides. No teeth on vomer, pterygoids and palatines. Six branchiostegals. Gillopenings wide; gillmembranes broadly united in front, attached to isthmus, leaving a very narrow free fold. Gillrakers on lower limb of first branchial arch less than 15 rudimentary scabrous tubercles. Mandibulary barbel present. Anus close to or remote from anal; in some species one or two scaleless fossae are developed on the mid-ventral line anterior to anus. First dorsal fin with the first spine rudimentary, the second more or less prolonged into a filament, rounded anteriorly and smooth. Second dorsal and anal manyrayed. Ventrals with 6—7 rays, the outer ray filamentous and somewhat prolonged; their origin below that

1) Bleeker (l. s. c.) has created the genera *Paramacrurus* [for *Lepidoleprus australis* Richardson = *Coelorhynchus australis* (Richardson) and *Oxymacrurus* for *Macrourus japonicus* Schlegel = *Coelorhynchus japonicus* (Schlegel)]. Both names are posterior (1874) to *Coelorhynchus* Giorna (1803).

of pectorals, which have 14 to 20 rays. Scales with spinules arranged in quincunx order or usually in definite series or placed in imbricate order on parallel or divergent carinae. No series of enlarged dorsal and ventral scales. Lateral line slightly arched or nearly straight above pectoral, running down to middle of tail and continued to its end. For other characters see those of the family. Size rarely surpassing 500 mm.

Distribution: As shown by GILBERT & HUBBS (U. St. Nat. Mus. Wash. vol. I. Part 7, 1920, Bull. 100, pp. 369—588), in their elaborate paper about the Macruroid fishes of the Philippine Islands and the East Indies, nearly half of the more than 50 known species of *Coelorhynchus* inhabit this region.

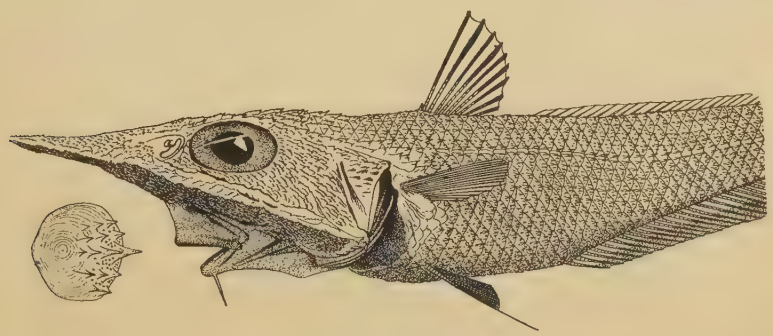

Fig. 8. *Coelorhynchus spinifer* Gilb. & Hubbs × 1/3.

Despite the occurrence of this large number of species, none of them, with the exception of a few, has been discovered in other faunal regions, also some of them have close representatives in the Indian, Japanese, and Hawaiian fauna. „The quoted region appears to be the center of their distribution, for in no other similar area in any of the seas is there known anything like the variety of species which occurs there".

Outside this region, the species of *Coelorhynchus* are distributed all over the world: in the Pacific from Japan to New Zealand, in the Atlantic from the coast of Norway to 52° South. They inhabit depths between about 70 and 2200 M., but usually they live in depths not exceeding 800 M. or less. Some of the species have a wide vertical distribution.

Key to the indo-australian species of Coelorhynchus.

I. Intermaxillary teeth in a narrow cardiform band, mandibulary teeth in two, anteriorly irregular, series, the inner one enlarged. Spinules on the scales in quincunx order. Five or six scales between origin of second D. and lateral line series. Underside of head naked. . . . . *C. argentatus* p. 40

II. Teeth in both jaws in villiform bands.

A. Spinules on scales on parallel or subparallel carinae of equal strength. Height of second D equal to or greater than postrostral length of head. Underside of head naked.

1. A scaleless fossa extending from anus to between ventrals, widest anteriorly. Second dorsal spine produced into a long filament. Dorsal contour of snout straight or concave.

a. Dorsal contour of snout straight; sides of snout strongly and evenly convex, without prominent antero-lateral angle. Five or fewer strongly spinous carinae on scales. Least orbital width 1.3 to 1.6 in postorbital part of head. . . . . *C. maculatus* p. 41.

b. Dorsal contour of snout concave; sides of snout not strongly convex with prominent antero-lateral angle. Seven to twelve carinae on scales. Least orbital width 1.5 to 1.8 in postorbital part of head.

a^1. Ventral rays 6; pectoral rays 14 or 15. Antero-lateral portion of snout with a few scales posteriorly. Two posterior saddle-like, rather indistinct markings, not ocellated. Scaleless fossa longer, extending forward to between front of ventral bases. *C. sexradiatus* p. 43.

a^2. Ventral rays 7; pectoral rays 16 or 17. Antero-lateral portion of snout largely prickly. Two posterior saddle-like markings very distinct, strikingly ocellated. Scaleless fossa shorter, extending forward only to opposite posterior end of ventral bases.

α. Snout shorter and blunter, 2.7 in head.

Distance of anus from anal 1.6 in distance of anus from outer ventral ray. *C. notatus* p. 43.

β. Snout much longer and sharper, 2.3 in head. Distance of anus from anal 2.6 in distance from anus to base of outer ventral ray. . . . . *C. triocellatus* p. 45.

2. No scaleless fossa anterior to anus. Second dorsal spine without filament, much shorter than head. Dorsal contour of snout convex . . . . . *C. argus* p. 46.

B. Spinules on scales in strongly divergent carinae, the lateral ones often weaker than the median. Height of second dorsal spine equal to or less than postorbital length of head. Underside of head covered by small scales or naked.

1. Snout less than twice as long as orbit in adult.

a. Snout without an acuminate tip; sides of snout very convex.

a^1. Underside of head and area between infraorbital ridge and orbit covered by small scales. . . . . *C. platorhynchus* p. 47.

a^2. Underside of head and area between infraorbital ridge and orbit completely naked *C. acantholepis* p. 48.

b. Snout with its tip more or less acuminate; sides of snout less convex, sometimes nearly straight.

a^1. Four to $4^1/_2$ scales between origin of second dorsal and lateral line scale.

α. Underside of head covered by small scales. Three to 7 strong spinous carinae on scales of body . . . . . *C. smithi* p. 49.

β. Underside of head naked. Six to 11 (5—8 in young) carinae on scales of body . . . . . *C. radcliffei* p. 50.

b^1. Five and a half to 7 scales between origin of second dorsal and lateral line scale . *C. commutabilis* p. 51.

2. Snout more than twice as long as orbit in adult. Underside of head completely scaled. . *C. macrorhynchus* p. 52.

C. Spinules on scales on a very strong median keel with others in parallel rows. Second dorsal spine shorter than postrostral length of head. Underside of head completely scaled.

1. Horizontal diameter of eye more than half length of snout, its length decidedly greater than

interorbital space. Spinules on scales of head moderately rough; several in number of subequal strength on a strong keel on each scute along the ridges . . . . . *C. parallelus* p. 53.

2. Horizontal diameter of eye about half length of snout, equal to interorbital width. Spinules on scales of head excessively rough; 1 to 3 only on each scute along the ridges. . . . . *C. spinifer* p. 54.

1. **Coelorhynchus argentatus** Smith & Radcl. [Fig. 9, p. 40].

Coelorhynchus argentatus Smith & Radcliffe in: Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 137.

Coelorhynchus acus M. Weber, Siboga-Expeditie, Fische, 1913, p. 160.

Coelorhynchus argentatus Gilbert & Hubbs, U. S. Nat. Mus. I. 1920, Bull. 100, p. 433.

Coelorhynchus argentatus Barnard, Ann. South African Museum XXI, 1925, p. 339.

B. 6; D^1. II. 8—10; D^2. ca. 100; A. ca. 100; P. 14—20; V. 7.

Head 3.8 to 4 in length; its sensory canal system well developed. Body moderately compressed, its dorsal contour scarcely elevated at origin of first dorsal; its greatest depth more or less than twice in head. Eye subelliptical, its greatest, horizontal diameter about 4, its vertical diameter 6 times in head. The horizontal diameter 1.4 times or more in snout and slightly shorter than the convex interorbital space, which is 1.4 to 1.6 times contained in the postorbital part of head. Snout more or less than 2.5 in head; its anterior half triangular, pointed, with the upper surface somewhat convex, laterally nearly straight. From tip of snout runs mesially a ridge to interorbital space, where it gets encompassed by two slightly curved ridges, running from occiput to middle of thickened upper border of orbit. This border begins as a conspicuous ridge at superior edge of operculum and is continued above nostril till triangular part of snout. Suborbital ridge not very prominent. Mouth rather large, its distance from tip of snout slightly shorter than length of snout; length of upper jaw more or less than 3 times in length of head, reaching behind hindborder of eye. Mandibular barbel more or less than half length of eye. Intermaxillary teeth slender, cardiform, the outer row slightly enlarged; the mandibular teeth in two series, the inner row enlarged. Scales thin, deciduous, five or six rows between origin of second dorsal and lateral line series. They are armed with short, stout spinules, arranged more or less in quincunx order; stronger and more erect on head. Second

dorsal spine nearly smooth, more or less than twice in head; distance of first dorsal from second, the first rays of which are very short, 4 times or less in length of head. Origin of anal, the rays of which are much longer than in the second dorsal, behind the origin of that fin. Pectorals 2.2 to 2.9, outer ventral ray 2.6 to 3.3 in head. Distance of anus from isthmus about 1.2 in head. Colour in alcohol silvery with neck

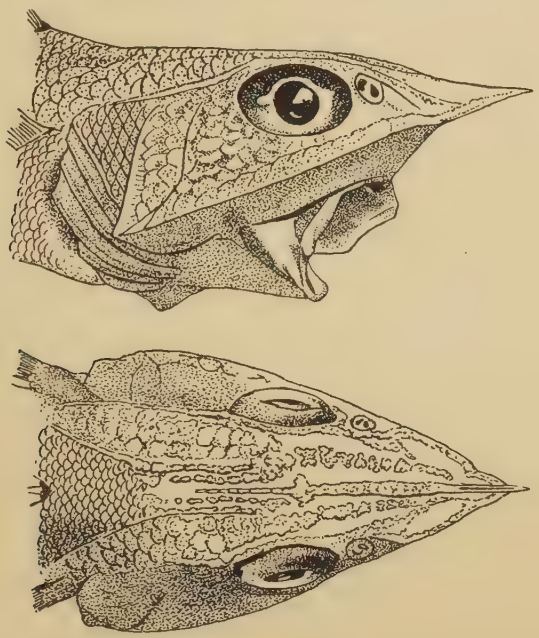

Fig. 9. *Coelorhynchus argentatus* Smith & Radcl.

and back light brown; vertical fins greyish; their border blackish, which colour increases posteriorly and occupies the end of these fins totally. Length 365 mm.

Habitat: Near Kei Islands 310 and 397 M.!, between Sulu and Tawi Tawi 486 M.; neighbourhood of Sulu 294 to 582 M. — Vicinity of Mindanao 183 to 366 M., off Southern Luzon 214 and 316 M.; east of Algoa Bay 85 M.

2. **Coelorhynchus maculatus** Gilb. & Hubbs.

Coelorhynchus maculatus Gilbert & Hubbs, U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 446.

B. 6; D^{1}. II. 9, P. 16—17; V. (6) 7.

Body slender, its greatest depth 1.8 to 1.9 in head. Dorsal

contour of snout straight, but more oblique than postrostral outline, which is nearly straight. Snout broad and deep, with the sides evenly and strongly convex to the bluntish tip, which is little or not produced; its length decreases with increased size. Scaly ridges of head strongly developed, occipital ridges in particular forming a high crest. Rounded-oblong orbit 3.2 to 3.4 in head, 1.2 to 1.3 in snout and once or somewhat more in postorbital part of head. Least interorbital space 2.2 in postorbital part of head. Mouth rather small; upper jaw, which extends to below hindmargin of pupil about 4 times in head. The outer series of teeth of the villiform intermaxillary band scarcely enlarged. Mandibulary barbel 3.5—5.5 in postorbital part of head. A well marked, narrow, scaleless fossa, widest anteriorly, extends from anus to between ventral fins. Scales with at most 5 strong spiniferous subparallel or somewhat divergent carinae; on body the median carina with 9, but usually fewer, strong, retrorse spinules, imbricate on one another and increasing in size posteriorly; the last one projects well beyond the margin of the scale. Scales reduced in size and armature on belly, especially toward isthmus. Undersurface of head scaleless; $5^1/_2$ or 6 scales between origin of second dorsal and lateral line scales. Second dorsal spine produced into a filament, almost as long as head. Base of first dorsal longer or shorter than interdorsal space. Origin of anal directly below anterior rays of second dorsal, the anterior rays of which are comparatively well developed. Fin rays decidedly longer in males than in females: pectoral 1.15 to 1.50, in females 1.6 to 2.1; outer ventral ray 1.3 to 1.4, in females 1.7 to 3 in head. Colour in alcohol dark brown, lighter ventrally, blackish on belly. A rounded blackish spot, ocellated by a whitish ring, extends from the lower end of pectoral base, upward and backward to and including first row of scales above lateral line; the spot is nearly as long as orbit and covers about eight rows of scales. A less regular and less distinct squarish spot in front of first dorsal; another indistinct blotch below posterior end of first dorsal. A dark bar, half the heads length behind the spot near pectoral. Branchiostegal membrane and opercle dull blackish. Length 191 (pseudocaudal developed). [After GILBERT & HUBBS, not seen by us].

Habitat: Between Halmahera and Makian 497 and 545 M. — Off southern Luzon 391 and 439 M.

3. **Coelorhynchus sexradiatus** Gilb. & Hubbs.

Coelorhynchus sexradiatus Gilbert & Hubbs, U. S. Nat. Mus. vol. 1, 1920, Bull. 100, p. 458.

B. 6; D^1. II. 8—9; P. 14—15; V. 6 (7).

Greatest depth of body 1.7 to 1.8 in head. Dorsal contour of snout concave; snout broadest at its base, its lateral contours converging forward in a convex curve; tip of snout sharp, as the terminal plate projects beyond margin of the following scales. Orbit 3.5 to 3.9 in head, 1.15 to 1.30 in postorbital part of head, 1.3 to 1.5 in snout. Interorbital space somewhat less than orbit, 1.55 to 1.85, least suborbital width 2.5 to 2.7 in postorbital part of head. Upper jaw subtends the anterior two-thirds of the orbit, its length 3.7 to 4.1 in head. Jaws with bands of fine teeth, the outer intermaxillary series not enlarged. Mandibulary barbel 3.4 to 4.6 in postorbital space. Scales on body with 8 to 12 (fewer in smaller specimens) parallel spinous carinae, each armed with as many as 14 rather weak retrorse imbricate spinules, which increase somewhat in size posteriorly; $4^1/_2$ to $5^1/_2$ scales between origin of second dorsal and lateral line scales. Those on head much smoother and more perfectly imbricate. Undersurface of head scaleless. Anus near origin of anal, the interspace being contained 2.9 to 3.7 in distance between anus and base of outer ventral ray, which is contained 1 to 1.4 in postorbital space. Second dorsal ray longer than head; pectoral 1.7 to more than 2, outer ventral ray 1.6 to 2 in head. Base of first dorsal 1 to 1.4 in interdorsal space and 1.4 to 1.8 in postorbital space. Origin of anal below middle or posterior part of interdorsal space. Colour in alcohol light brown, belly dark, becoming blackish between ventrals. An ocellated blackish spot extends upward and backward from pectoral onto first row of scales above lateral line covering 5—7 rows of scales extending downward and backward. A dusky blotch between first dorsal and occiput, and only faint traces of the dusky saddle of *C. notatus*. Length 205 mm. [After GILBERT & HUBBS, not seen by us].

Habitat: Vicinity of Sulu 444 and 581 M.

4. **Coelorhynchus notatus** Smith & Radcl.

Coelorhynchus notatus Smith & Radcliffe in: Radcliffe, Proc. U. S. Nat. Mus. vol. XLIII, 1912, p. 136.

Coelorhynchus notatus Gilbert & Hubbs, U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 462.

B. 6; D[1]. II. 9; P. 17; V. 7.

Body compressed, its greatest depth 1.7 in head. Head short, occipital ridges low, suborbital ridge salient, ending abruptly in front of angle of preopercle, which is projecting, the free margin slightly concave. Eye large, subelliptical, horizontal diameter 3.3 in head, vertical diameter 1.44 in horizontal diameter, which is contained 1.1 in postorbital part of head and 1.2 in snout. Snout 2.7 in head, pointed, its dorsal outline slightly concave, laterally slightly convex. Interorbital space broad, flat, equal to vertical diameter of eye, 4.77 in head. Least suborbital width 2.6 in postorbital space. Mouth of moderate size, its distance from tip of snout 3 in head. Length of upper jaw 3.7 in head, reaching posterior third of eye. Mandibular barbel rather stout, about half horizontal diameter of eye. Teeth slender, in a narrow cardiform band, the outer intermaxillary series scarcely enlarged. Scales regular, those on body with 7 to 9 nearly parallel spinous carinae of moderate strength. These carinae are armed with as many as 11 slender spinules, directed backward and imbricate, increasing but little in size posteriorly; the last spinule projects beyond the margin of the scale. There are $5\frac{1}{2}$ scales between origin of second dorsal and lateral line scales. Underside of head scaleless, scales below orbit small, those on opercles not reduced and bear as many as 12 divergent carinae. Part of snout above is covered with prickles. Anus remote from anal, the interspace being contained 1.6 times in the distance from the anus to outer ventral ray, a distance slightly shorter than orbit. The filamentous second dorsal spine 1.2 in head. Base of first dorsal 1.2 in interdorsal space or 1.4 times in postorbital part of head. Anal originates in advance of second dorsal a distance one-third as great as interval between the dorsals. Pectoral equal in length to filamentous ventral ray, which is contained 1.9 times in head. Colour in alcohol: Ground colour of back dusky russet brown, becoming lighter ventrally; belly with blackish shades showing through scales; a small dusky area above opercle; a large circular dark brown area extending across back behind origin of second dorsal; a second as far behind first as first is behind origin of first dorsal, slightly lighter in coloration; basal sixth of second dorsal spine light

brownish yellow, distal portion dusky black, the dark markings of this spine extending onto distal portion of soft rays; second dorsal light; basal portion of anal light, distal portion punctulate with darker, the marginal portion of fin anteriorly almost black; ventrals dusky black, filament or outer ray whitish; pectoral dusky white. Length of single specimen known 268 mm. (tail broken). [After RADCLIFFE and GILBERT & HUBBS, not seen by us].

Habitat: Alice Channel, connecting Sulu Sea and Celebes Sea 421 M.

5. **Coelorhynchus triocellatus** Gilb. & Hubbs

Coelorhynchus triocellatus Gilbert & Hubbs, U. S. Nat. Mus. vol. I. Prt. 7, 1920, Bull. 100, p. 466.

B. 6; D^{1}. II. 9; P. 16—17; V. 7.

Slender and comparatively strongly compressed; greatest depth 1.9 in head. Dorsal contour of head concave on snout, straight on postorbital part of head. Snout long, slender, and sharply pointed, with sides but little convex; its preocular length 2.3, its preoral length 2.45 times in length of head. Orbit 3.6 in head, about once in its postorbital part and 1.6 in snout. Least interorbital width 1.6 in postorbital part; least suborbital width 2.5. The maxillary subtends the anterior two-thirds of the orbit; the length of upper jaw contained 4.5 times in head. Villiform teeth in bands on jaws; the outer intermaxillary series scarcely enlarged. Barbel 5.7 times in postorbital part. Distance from centre of anus to origin of anal contained 2.6 times in distance between anus and base of outer ventral ray. Scales of body with 7 to 10 spinous carinae, bearing 9 or fewer sharp, curved spinules. Five and a half scales between origin of second dorsal and lateral line scales. Underside of head completely scaleless. Second dorsal spine long and filamentous being contained more than once in head. Base of first dorsal 1.2 in interdorsal space and 1.4 in postorbital part of head. Origin of anal anterior to vertical from middle of interdorsal space. Pectoral 1.6 in head. Light brown, belly with a dark shade. A blackish brown spot above pectorals extends upwards to lateral line and covers six scale rows. Below the second dorsal two widely separated, saddle-

like, faintly ocellated spots. Length of single specimen known 190 mm. [After GILBERT & HUBBS, not seen by us].

Habitat: North of Tawi Tawi, Sulu Archipelago, 576 M.

6. Coelorhynchus argus M. Web. [Fig. 10].

Coelorhynchus argus M. Weber, Siboga-Exped., Fische, 1913, p. 161.
Coelorhynchus argus Gilbert & Hubbs, U. S. Nat. Mus. I. 1920, Bull. 100, p. 472.

B. 6; D[1]. II. 8—9; A. ca. 70—80; P. 15—17; V. 7.

Height of body 1.6 to 1.8 in length of head, which goes 4 times or somewhat less in total length. Diameter of eye about 3.4 in head, slightly longer than postorbital part of head and about one half eye-diameter shorter than snout, the dorsal

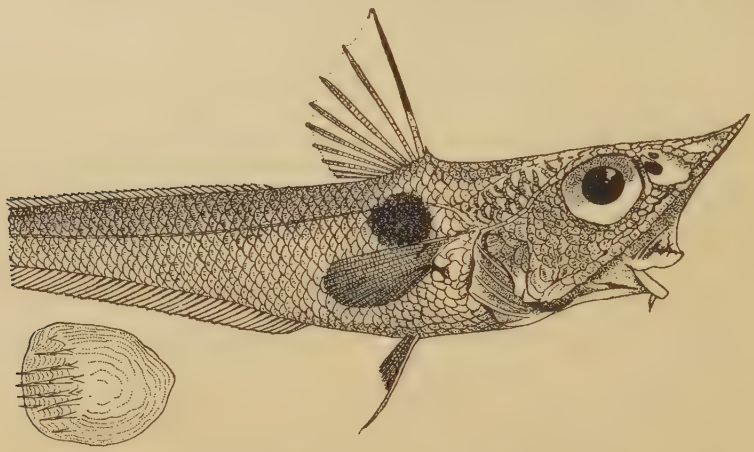

Fig. 10. *Coelorhynchus argus* M. Web. $\times 4/5$.

contour of which is more or less concave. Its outer borders are evenly convex and unite in a rather sharp point. The snout goes 2.2 to 2.3 times in head. Interorbital space 4.4 to 4.7 in head and equal to or somewhat more or less than half the length of the snout. Mouth small, the distance of its front-border from tip of snout somewhat shorter than snout; the upper jaw extends about to vertical through hindmargin of pupil. Bands of minute teeth in jaws. Length of barbel $^1/_4$ to $^1/_5$ diameter of eye. The infraorbital ridge, covered by sharply spinulated scales, is strongly prominent and runs from point of snout to rounded angle of preopercle. The median rostral ridge is covered by 7—9 more or less elliptical spinulated scales. Supraorbital ridge, only faintly continued to superior

angle of operculum. From each side of the middle of the interorbital space a ridge runs to end of head. Ventral surface of head wholly naked. Scales on body armed with 6—8, or even 9 nearly parallel series of spines, increasing in size posteriorly, where those of the middle series project beyond the scale. Four scales between last ray of first dorsal and lateral line series. Second dorsal equals height of body. Its base situated midway between origin of pectoral and ventral. Outer filamentous ray of ventrals slightly shorter than pectorals which equal length of snout. Interdorsal space about as long as eye. Colour in alcohol grayish brown; a darker ocellus in a lighter circular patch, about the size of the eye, between first dorsal and pectoral. Ventrals and first dorsal blackish, the last with a whitish base. Length 190 mm.

Habitat: Bali Sea 538 M.!; Flores Sea 521 M.!; Strait Makassar 450 M.!; Molucco-Passage 397 M.!. — Vicinity of Philippines in depths from 247—424 M.

7. **Coelorhynchus platorhynchus** Smith & Radcl.

Coelorhynchus platorhynchus Smith & Radcliffe, in: Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 133.

Coelorhynchus platorhynchus Gilbert & Hubbs, U. S. Nat. Mus. vol. I. Prt. 7, 1920, Bull. 100, p. 484.

B. 6; D^1. II. 9; D^2. 88; A. 88; P. (16)—18; V. 7.

Body rounded, its greatest depth about twice in length of head. Head short, broad, greatest breadth and depth about equal. Snout short, broad, with a strong median dorsal ridge, its preocular length 2.5 to 2.9, its preoral length 2.9 to 3.3 in head. Horizontal diameter of eye 3.3 to 3.6 in head, 1.2 in its postorbital part, 1.2 to 1.4 in snout. Least suborbital width 2.4 to 3 in head. Suborbital ridge prominent. Interorbital width about 4.5 in head. Length of upper jaw 3.8 to 4.1 in head, extending to behind hindmargin of pupil. Barbel about one third length of eye. Rostral, supraorbital and the widely diverging occipital ridges strongly developed, covered by greatly strengthened modified scales in the form of elongate tubercles which may be armed by spiniferous keels. Teeth cardiform, incurved. Underside of head wholly covered by small scales. Distance from center of anus to base of outer ventral ray 2.1 to 2.9 in head. Scales with 5 to 7 widely divergent keels, armed with about 6 very strong broad spinules, increasing in

strength posteriorly. Second dorsal spine nearly as long as snout plus eye, interdorsal 0.22 length of head. Ventrals small, outer filamentous ray about 0.50 length of head, reaching origin of anal or not so far. Pectorals 2 to 2.4 in head. Light brown, fins somewhat darker. Length 387 mm. [After RADCLIFFE and GILBERT & HUBBS, not seen by us].

Habitat: Vicinity of Sibuku Bay, Borneo, 870 M.; Gulf of Boni 900 and 933 M. — East coast of Luzon 595 M.

8. **Coelorhynchus acantholepis** Gilb. & Hubbs.

Coelorhynchus platorhynchus form *alpha* Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 134.

Coelorhynchus japonicus M. Weber, Siboga-Expeditie, Fische, 1913, p. 163 (nec *Macrurus japonicus* Temminck & Schlegel).

Coelorhynchus acantholepis Gilbert & Hubbs, U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 488.

B. 6; D^{I}. II. 9; A. 70—80; P. 16—18; V. 7.

Height 7—8, head 4 in total length, its dorsal contour ascending in a straight line. Eye nearly in the middle between point of snout and posterior border of opercle, its diameter 3.1 to 3.9 in head, 1.2 to 1.5 in length of snout, 1.1 to 1.4 in postorbital part of head and conspicuously longer than least width of interorbital space, which goes 1.4 to 1.6 in postorbital part of head. Snout 2.5 to 2.8 in head, its outer borders convex, converging abruptly into a point. From this point runs a median rostral ridge, covered by about 10 subquadrate carinate scales to a line connecting the frontborder of the eyes. A series of keeled scutes borders the orbit above and nearly reaches the upper angle of the operculum. Two similar parellel ridges run from the middle of the interorbital space to the end of the head. The prominent infraorbital ridge, running from the point of snout to the rounded, protracted corner of the preopercle, have the scales sharply spinulated. The underside of the head below this ridges is completely naked and finely papillated. Upper jaw reaches about behind pupil. Barbel about one third of diameter of eye. A band of minute teeth in both jaws. Body-scales with 4 to 7, generally 5 to 6 diverging series of sharp spinules, which, with increasing length of the fish, are more flattened into carinae and less prominent beyond the hindborder of the scale. On the dorsal surface of the head some of them are more like carinated tubercles. There are 4 scales between last ray of first dorsal

and the lateral line series, $4^1/_2$ between that line and origin of second dorsal. Origin of first dorsal and ventral situated in the same vertical. Outer filamentous ray of ventral in small specimens slightly longer, in larger specimens somewhat shorter than pectorals. Second dorsal spine somewhat more than half length of head. Colour in alcohol uniform greyish brown; fins, opercle, underside of head and belly blackish. Length 420 mm.

Habitat: Bali Sea 538 M.!; Flores Sea 521 and 694 M.!; Strait Makassar 724 M.!; near Kei Islands 560 M.!; Arafura Sea 304 M.!; vicinity of Sibuku Bay, Borneo 635 and 759 M.

9. **Coelorhynchus smithi** Gilb. & Hubbs.

Coelorhynchus commutabilis Smith and Radcliffe, in Radcliffe, Proc. U.S. Nat. Mus. XLIII. 1912, p. 128 (p. parte).

Coelorhynchus smithi Gilbert & Hubbs, U. S. Nat. Mus. Wash. vol. I. 1920, Bull. 100, p. 493.

B. 6; D^1. II. 8—10; P. 15—19; V. 7.

Greatest depth of body 1.8 to 2.3 in length of head. Dorsal contour of head convex, of snout slightly concave. Its preocular length 2 to 2.4, preoral length 2.2 to 2.9 in head. Orbit 3.4 to 3.9 in head, 1 to 1.3 in its postorbital part, 1.5 to 1.9 in snout. Interorbital space 1.3 to 1.6 in postorbital part; least suborbital width 2.3 to 2.6 in head. Upper jaw extends to behind pupil or to below hindmargin of eye, its length contained 3.3 to 4.7 in head. Barbel 3.6 to 5.6 in postorbital part. Spinous infraorbital, supraorbital and occipital ridges strongly developed, the lastnamed diverge anteriorly and posteriorly. The scales on the infraorbital ridges are closely set with rather strong spinules; these scales are in two series behind vertical through middle of eye. Underside of head covered with very small scales. Distance between center of anus and base of outer ventral ray is contained 3.6 to 5.8 times in head. Scales of body armed with 3 to 7 strongly spinous carinae, the median one of which is strongest, armed by about 4 to 6 spinules. Second dorsal spine 2.6 to 2.7, pectorals 2.4 to 2.9; outer ventral ray 2.4 to 3.3 in head; length of base of first dorsal 1.4 to 1.7 in interdorsal space and 1.8 to 2.2 in postorbital length of head. Brown, belly sometimes dark, opercle with a dark blotch, fins dark. The young have darker bars on the tail. Length 263 mm. [After GILBERT & HUBBS, not seen by us].

Habitat: Near Sibuku Bay, Borneo, 567 M.; between Halmahera and Makian Island 545 M. — East coast of Mindoro 402 to 516 M.; near western Bohol 402 M. — Vicinity of northern Mindanao 402—413 M.; between Cebu and Siquijor 567 M.; between Negros and Siquijor 468 and 510 M.

10. Coelorhynchus radcliffei Gilb. & Hubbs.

Coelorhynchus commutabilis form *beta* Smith & Radcliffe in Radcliffe, Proc. U. S. Nat. Mus. XLIII, 1912, p. 131.

Coelorhynchus commutabilis form *gamma* Smith & Radcliffe, l.c.

Coelorhynchus Radcliffei Gilbert & Hubbs, U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 498.

B. 6; D[1]. II. 7—9; P. 15—18; V. 7.

Greatest depth of body 1.9 to 2.3 in head. Head in adult slightly convex. Snout slightly concave along its dorsal margin, more so in the young, where the snout is much longer, dorsally more concave and more pointed. Its preocular length 2.1 to 2.75, its preoral length 2.3 to 4.1 in head, both lengths decreasing with the size of the fish. Orbit contained 3.4 to 3.7 times in length of head, more than once in its postorbital part, 1.2 to 1.7 times in snout. Interorbital space 1.3 to 1.5, least suborbital width 2.5 to 2.8 in postorbital part. Upper jaw extends in smallest specimens to below hindmargin of pupil, in largest to below hindmargin of orbit; its length is contained in the head from 4.4 times in the smallest, to 3.3 times in the largest specimens. Barbel 3.4 to 4.7 in postorbital part. Villiform teeth in the jaws. Anus immediately before origin of anal; its distance from base of outer ventral ray less than the distance between ventral fin and isthmus. Scales large, with 6 to 11 carinae in specimens more than 95 mm. long to anus, and 5 to 8 in smaller specimens; on each carina 6 (in smaller specimens) to 8 spinules. Underside of head completely naked. Between origin of second dorsal and lateral line series 4 to $4^1/_2$ scales. Ridges on head covered by rather strong scales, mostly close-set with spinules; the infraorbital ridge covered by two series of scales behind the middle of orbit. Base of first dorsal about half postorbital length of head; anal inserted a little in advance of second dorsal. Outer ventral ray filamentous, 2.4 to 3.2 in head. Light brown, with silvery reflections on the lower side, opercles and fins dusky. Length 268 mm. [After GILBERT and HUBBS, not seen by us].

Habitat: Between Halmahera and Makian Island 526; between Halmahera and Kajoa Island 485 M. — Philippine Islands in 347 to 567 M. depths.

11. Coelorhynchus commutabilis Smith & Radcl.

Coelorhynchus commutabilis typical form Smith and Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. vol. XLIII, 1912, p. 128, textfig. 2 (part).
Coelorhynchus commutabilis form *alpha* Smith and Radcliffe, l.c. p. 130, textfig. 3.
Coelorhynchus commutabilis form *delta* Smith and Radcliffe, l.c. p. 132, textfig. 6.
Coelorhynchus commutabilis form *eta* Smith and Radcliffe, l.c. p. 132, textfig. 7.
Coelorhynchus commutabilis Gilbert & Hubbs, U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 507.

B. 6; D[1]. II. 9; P. 20; V. 7.

The dorsal and ventral contours are long, even curves; the base of first dorsal scarcely oblique; depth of body 1.8 to 2.3 in head. Orbit 3.33 to 3.95 in length and 1.15 to 1.3 in postorbital part of head, these variations not correlated with the size of the specimens. Snout dorsally little or scarcely concave, its length unusually variable, 2.3 to 2.7 in head. Interorbital space 1.3 to 1.6, least suborbital width 2.2 to 2.9 in postorbital part of head. Ridges of head covered by a single series of strong scales, excepting the infraorbital ridge behind middle of eye, where the scales are in two series. Occipital ridges diverge a little toward both ends. Upper jaw extends to below hindmargin of orbit, its length is contained 3.3 to 4 times in head; barbel 3.5 to 6 in postorbital part of head. Distance between center of anus and base of outer ventral ray a little longer than postorbital and contained 2.4 to 3 times in head. Scales rather small, $5^1/_2$ between front of second dorsal and lateral line series. They bear 3 to 7, usually 5 carinae, armed by a series of posteriorly increasing spinules overlapping the margin of scale; the median series is often enlarged. Underside of head covered by small scales. Second dorsal spine 1.8 to 2.1 in head. Length of base of first dorsal 1.3 to 1.7 in interval between dorsals. Outer ventral ray ending in a slender filament, 2.1 to 3 in head. Colour in alcohol grayish brown, becoming lighter below; fins blackish. Length 129 mm. [After Gilbert & Hubbs, not seen by us].

Habitat: Near Sibuku Bay, Borneo 475 and 567 M. — Vicinity of Jolo Island 582 M.; Palawan Passage 685 M. off eastern Luzon 563 and 700 M.

12. Coelorhynchus macrorhynchus Smith & Radcl.

Coelorhynchus macrorhynchus Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 127.

Coelorhynchus macrorhynchus Gilbert & Hubbs, U. S. Nat. Mus. Vol. I. 1920, Bull. 100, p. 511.

B. 6; D^1. II. 8; D^2. 67; A. 76; P. 18; V. 7.

Body robust, greatest breadth about 0.66 its depth. Eye subelliptical, horizontal diameter 5.48 in head, slightly more than 0.66 length of snout; interorbital broad, flat, equal to horizontal diameter of eye. Snout 2.15, outlines long, narrow, scarcely at all convex, converging regularly from base to tip, depressed, upper surface everywhere transversely convex, longitudinally slightly concave. Maxillary 3.48, nearly reaching vertical from posterior margin of orbit. Barbel long, slender, about 0.87 horizontal diameter of eye. Suborbital ridge strongly salient, ending abruptly at a distance nearly equal to diameter of pupil from angle of preopercle; the two ridges on each side of nape well developed, converging and meeting over anterior margin of eye. Teeth slender, cardiform, those along outer margin of upper jaw very slightly enlarged. Scales large, imbricate; $5^1/_2$ between origin of second dorsal and lateral line scales. Those on body armed with about 7 radiating subequal spinous ridges, posterior spines projecting but little beyond margin of scales. Scales of median dorsal line of snout, those between the two lateral ridges on each side of nape, on opercle and distal portion of preopercle, and along suborbital ridge have the ridges very distinct, strongly radiating. Vent slightly less than half an eye diameter in front of origin of anal. Second dorsal spine 3.41 in head, long, slender, smooth throughout; interdorsal space 4.02 in head. Origin of anal under origin of second dorsal. Ventrals small, outer ray with a short filament, its length 4.31 in head, tip not reaching vent; pectoral 2.83, equal to postorbital part of head. Colour in alcohol: hair-brown; the fins, their bases, and branchiostegal membranes dark clove-brown. Length 560 mm. [After SMITH & RADCLIFFE, not seen by us].

Habitat: Vicinity of Sibuku Bay, Borneo 759 M. — Off Southern Luzon 432 M., Verde Island Passage 329 M., North of Tawi Tawi 576 M. and 622 M.

13. Coelorhynchus parallelus (Gthr.). [Fig. 11].

Macrurus parallelus Günther, Ann. Mag. Nat. Hist. (2) XX. 1877, p. 439; Deep Sea fishes, Challenger Reports XXII. 1887, p. 125 (p. p.).

? *Macrurus parallelus* Alcock, Ann. Mag. Nat. Hist. (6) IV. 1889, p. 391. — Journ. Asiatic Soc. Bengal XLIII. 1894, p. 126. — Descript. Cat. Indian Deep-Sea Fishes 1899, p. 106.

Coelorhynchus parallelus Jordan & Gilbert, in Jordan & Starks, Bull. U. S. Fish Comm. (1902) 1904, p. 618.

Coelorhynchus parallelus M. Weber, Siboga Expeditie, Fische, 1913, p. 163.

Coelorhynchus parallelus Gilbert & Hubbs, Proc. U S. Nat. Mus. LI. 1916, p. 181.

Coelorhynchus parallelus Gilbert & Hubbs, U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 515.

B. 6; D¹. II. 9; A. 80—90; P. 16—17.

Head somewhat convex in its orbital part. Snout dorsally straight, acutely pointed in front, with slightly convex lateral borders, about 2.4 in head. Horizontal diameter of eye 4 times

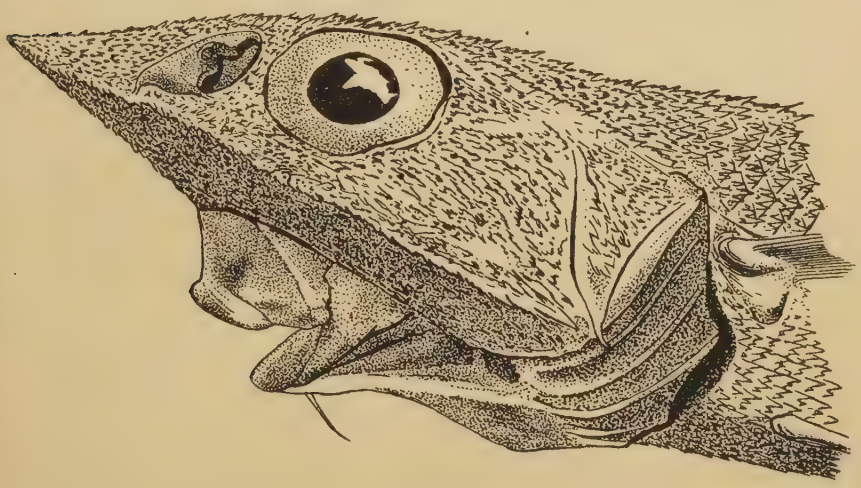

Fig. 11. *Coelorhynchus parallelus* (Gthr.).

or somewhat less in head, 1.6 in snout and about 1.3 in post-orbital part of head, which goes less than 3 times in head. Slightly convex interorbital space nearly equals horizontal diameter of eye and goes 3.4 to 3.7 in head. Infraorbital ridge prominent, covered by scales with strong spinulated keels; those of the supraorbital ridge, which is continued to upper angle of operculum, are narrow and keeled. Median rostral ridge not prominent, continued to line connecting frontborder of eyes. Behind that line begins on each side of interorbital

space a ridge extending to end of head. These ridges carry also strongly keeled scales. Mouth small; the distance of its frontborder from point of snout about equal to length of snout. Upper jaw reaches hindborder of pupil and goes about 4 times in head. Underside of head covered with small scales. Teeth in jaws in villiform bands. Anus immediately before anal. Scales with 3—5 parallel keels of which the median one is especially strong and prominent beyond the hindborder of the scale; they consist of imbricating spinules, increasing in size posteriorly; their number increases with growth f.i. in a specimen of 125 mm. the arrangement is $2.2.2 = 6$, in one of 220 mm. of same place $2.3.4.3.2 = 14$. Five scales between origin of second dorsal and lateral line scales. Second spine of first dorsal weak, filamentous in its distal part and shorter than half length of head. Origin of second dorsal behind that of ventral. Outer filamentous ray of ventral as long as or longer than postorbital part of head. Pectorals somewhat longer than horizontal diameter of eye. Colour in alcohol uniform brown. Length 450 mm.

Habitat: Flores Sea 694 M.!; Ceram Sea 567 M.!; Halmahera Sea 827 M.!; Savu Sea 959 M.!. — East coast of Luzon 700 M., Seas of Japan 430 to 1033 M.,? Gulf of Manar 1092 M. [1]). — Off the Kermadec Islands 1152—1097 M.; off New Zealand 1280 M.;? near the Hawaiian Islands (GILBERT & CRAMER).

14. **Coelorhynchus spinifer** Gilb. & Hubbs. [Fig. 8, p. 37].

Coelorhynchus macrorhynchus M. Weber, Siboga-Expedit., Fische, 1913, p. 162 (nec Smith & Radcliffe 1912).

Coelorhynchus spinifer Gilbert & Hubbs, U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 516.

B. 6; D^1. 11. 8—9; P. 17—19; V. 7.

Sides of head convex, snout broad, its dorsal surface only slightly concave; twice in head. Horizontal diameter of eye 4.3 in head, 2.2 in snout, 1.3 in postorbital part of head, which goes 3.4 in head. Interorbital space about equal to eye. Upper jaw somewhat more than 4.5 in head, it extends to hindmargin of pupil, the distance of its frontborder from point of

1) *Coelorhynchus parallelus* Brauer, Tiefsee-Fische, Valdivia-Expedition, 1906, p. 257 from the Atlantic does not belong to this species; it differs f.i. in a much smaller interorbital space and a totally different armement of scales.

snout slightly longer than snout. Barbel less than thrice in diameter of eye. Infraorbital ridge very prominent to end of opercle, covered by keeled scutes with prominent strong spines; supraorbital ridge less prominent, its postocular continuation to superior angle of operculum with more flattened scutes, as also the two parallel supraoccipital ridges beginning in the middle of the interorbital space; rostral ridge not prominent. Underside of head covered by more or less sharp tubercle-like scales. Teeth in jaws in rather narrow bands. Scales near their margin with a strong, elevated median spine, preceded by one to three smaller imbricate spinules; there may be present a single spinule dorsally or ventrally from the median series. Four and a half scales between origin of second dorsal and lateral line scales. Second dorsal spine about equal to postorbital part of head; pectorals of same length; filamentous ray of ventrals somewhat longer. Distance of anus from base of ventrals longer than that of ventrals from isthmus, and about $^1/_3$ longer than diameter of eye. Colour in alcohol brownish, fins darkbrown. Length 295 mm. (end of tail regenerated).

Habitat: Savu Sea 959 M.!; Gulf of Tomini, Celebes 1392 M.

3. **Hymenocephalus** Giglioli.

(Giglioli, New deep-sea Fish from Mediterranean, Nature Dec. 28, 1882, London 1883, p. 198 and Giglioli & Issel, Pelagos, Saggi sulla vita et sui prodotti del mare, Genova 1884, p. 228 figura (descr. nulla)).

Size small, scarcely exceeding 200 mm. Body fragile, slender throughout or deeper and sharply compressed, tail tapering into a more or less whipe-like filament. Head cylindrical and its sides strongly convex or more quadrate with subparallel lateral contours. Sensory canal-system of head well or excessively developed, forming shallow, wide grooves separated by thin but firm or delicate and papery bony septa and roofed over by firm or very delicate and fragile membranes. Bony crests of skull also thin. Eye elliptical or nearly circular. Snout rounded with more or less projecting median tip. Mouth large, inferior, subterminal; lower jaw included in upper, which reaches to or beyond hindmargin of eye. A mandibulary barbel present or absent. Opercle with more or less vertical hindborder or much expanded and rounded. Branchial aperture extended forward to below hindmargin of orbit, where the gillmembranes unite; they are free from isthmus.

Branchiostegals 7. On lower limb of first gillarch 18 to 12 spiny gillrakers which may be reduced to tubercles. Pseudobranchiae absent. Teeth in narrow villiform bands in jaws, minute, they may be arrow-shaped. Scales very caducous, thin, round with or without short weak spinules. Lateral line present. An anterior lens-shaped organ situated before ventrals and a posterior larger one, circular, elongate or bilobate in outline, just before vent. Both are connected by a more or less raised narrow strand of tissue below peritoneum, covered by black pigment. The area between isthmus and anus more or less extensively striated by transverse or partly longitudinally arranged parallel, more or less conspicuous alternating black and silvery lines connected with a structural modification of the skin. Anus immediately before anal. Second dorsal spine usually smooth, it may be weakly denticulated. Second dorsal much lower than anal; its origin nearly opposite to that of anal but usually far before that of anal; accordingly the interdorsal space shorter or usually much longer than half length of head. Origin of pectorals below or slightly before that of first dorsal; origin of ventrals before that of pectorals. Six to 15 ventral rays, the outer ray usually produced.

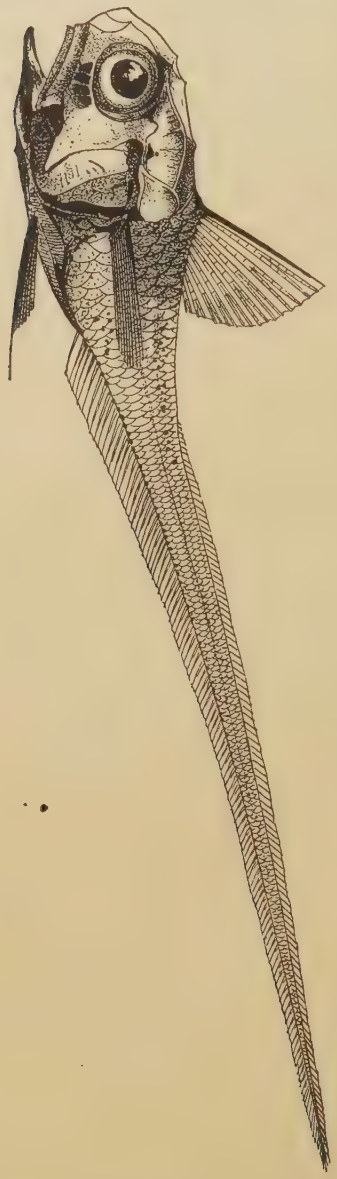

Fig. 12. *Hymenocephalus grimaldii* M. Web. n.s.

Distribution: Indo-Australian Archipelago, Philippines,

China Sea, Hawaiian and Fiji Islands, Gulf of Mexico, Coast of Morocco, of Soudan, Cape Verde Islands, Azores, Southern Mediterranean. In depths of 100 to 2083 M.

Key to the indo-australian species of Hymenocephalus.

1. Ventrals with 8 rays; barbel much longer than eye . *H. longiceps* p. 57.
2. Ventrals with 6 to 9, usually 8 rays; barbel much shorter than eye or wanting.
   a. Barbel present; interorbital space about equal to length of orbit or less . . . . . *H. striatissimus* p. 58.
   b. Barbel absent; interorbital space one-third less wider than eye. . . . . *H. grimaldii* p. 59.
3. Ventrals with 11 to 13, usually 12 to 13 rays; barbel absent . . . . . *H. lethonemus* p. 60.

1. Hymenocephalus longiceps Smith & Radcl.

Hymenocephalus longiceps Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 111.

Hymenocephalus striatissimus (forma Siboga Exped. Station 38) M. Weber, Siboga-Exped. Fische, 1913, p. 168.

Hymenocephalus longiceps Gilbert & Hubbs, U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 525.

B. 7; D^1. II. 9—10; D^2. 138; A. 134; P. 14—17; V. 8.

Long and slender, tail ending in a very long filament; dorsal contour convex. Head 6.2 to 6.5 in total length, compressed, its crest rather firm. Eye subcircular, about 3.2 in head, 1.6 in postorbital part of head, one third shorter than snout, which goes more than four times to 4.8 in length of head and is somewhat pointed but scarcely protruding beyond intermaxillaries. Interorbital narrow, about equal to eye and 4.8 in head. Mouth large, upper jaw reaching beyond posterior margin of eye. Barbel very long and slender, more or less than two-thirds length of head. Teeth in narrow villiform bands. Scales deciduous, large, 3 in a series between end of first dorsal and lateral line scales; they are covered in their exposed part with serially arranged short, weak spinules. Striation of abdominal region extensive. Lens-shaped body situated just before anus, large and much protruding, being nearly half as wide as pupil. A median black band connects it with the similar but much smaller organ, located before ventrals. Second dorsal spine smooth. Origin of first dorsal immediately behind head,

that of pectorals below it. Outer ventral ray greatly produced. Colour in alcohol brownish, underside with silvery reflections as also the otherwise blackish opercle and underside of head; fins dusky, their bases black. Length about 220 mm.

Habitat: Flores Sea 521 M.!; Vicinity of Darvel Bay, Borneo 296 M.; between Halmahera and Makian Islands 545 M.; Sulu Archipelago. — Philippine Islands, China Sea, near Formosa and Hongkong in depths from 196—494 M.

2. **Hymenocephalus striatissimus** Jord. & Gilb.

Hymenocephalus striatissimus Jordan & Gilbert, in Jordan & Starks, Bull. U. S. Fish Comm. (1902), 1904, p. 612.

Hymenocephalus torvus Smith and Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 110.

Hymenocephalus striatissimus M. Weber, Siboga-Exped., Fische, 1913, p. 168 (p. p.) [1]).

Hymenocephalus striatissimus Gilbert & Hubbs, Proc. U.S. Nat. Mus. LI. 1916, p. 187.

Hymenocephalus striatissimus aeger Gilbert & Hubbs, U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 531.

B. 7; D^1. II. 8—10; P. 13; V. 8 (rarely 7 to 9).

Head subquadrate, its greatest width equals its postorbital length. Greatest diameter of nearly circular eye 3 to 3.1 in head, about equal to interorbital space, which goes 2.7 to 3 times in head. Snout blunt, scarcely projecting beyond front-border of mouth, 4 to 4.4 in head. Middle of length of head lies near hindmargin of pupil. Mouth oblique, not reaching vertical through hindmargin of pupil. Barbel half length of head or somewhat more. Teeth minute, in narrow bands in jaws. Scales with weak spinules, 5 between first dorsal and lateral line scales. Striation of abdominal region extensive, developed in a longitudinal and transverse type, forming before the ventrals a pair of silvery spots, with more irregular striation. The two lens-shaped bodies, surrounded by a black ring, the posterior including the vent. Seventeen to 18 spinous gillrakers. Second dorsal spine smooth, about 1.3 in head. Origin of pectorals somewhat before that of first dorsal, but behind that of ventrals, the first ray of which is filamentous. Colour in alcohol brownish with traces of a silvery band along middle of sides, separated from belly by a dark line; tail lighter; belly and underside of head and opercle blackish with metallic lustre; cheeks and preopercle silvery; fins dusky. Length 210 mm.

1) Cfr. p. 57 sub *Hymenocephalus longiceps* Gilb. & Hubbs.

Habitat: Madura Sea 289 M.!; Macassar Straits 450 M.!; Timor Sea 520 M.!; Sibuku Bay, Borneo 475 and 567 M.; between Halmahera and Kajoa Island 230 and 235 M.; between Halmahera and Makian Island 298 M.

Note. GILBERT & HUBBS (U.S. Nat. Mus. vol. I. 1920, Bull. 100, p. 528) distinguish three geographical subspecies from Japan southward to the indo-australian Archipelago, according to the number of ventral rays (7 to 8), to minute differences in the relation of the orbit to the postorbital, varying between 0.9 and 1.35, and to the barbel, the length of which varies from half length of pupil to slightly longer than pupil. These differences intergrade.

3. **Hymenocephalus grimaldii** M. Web. [Fig. 12, p. 56].

Hymenocephalus Grimaldii M. Weber, Siboga-Exped., Fische, 1913, p. 169.
Hymenocephalus grimaldii Gilbert & Hubbs, U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 535.

B. 7; D[1]. II. 9; A. ca. 100; P. 10; V. 8.

Long and slender, height 6.5 to 7.6. Head 5.7 to 5.8 in length; nearly quadratic, only lower jaw ascending from behind forward. Snout blunt, somewhat shorter than eye, 3.9 to 4 in head and about one half postorbital length; only the anterior point of its median ridge, which extends to end of interorbital space and surpasses the supraorbital ridges, is scarcely produced beyond upper jaw. Eye circular, 3.4 to 3.5 in head, posterior border of pupil about in middle of length of head. Interorbital space about $^1/_3$ broader than diameter of eye. Lower jaw included in upper jaw, which extends to hindborder of eye and has nearly half length of head. Bones and ridges of head separating the sensory cavities are papery and bridged over by exceedingly thin membranes; suborbital area formed by an extremely thin bony plate, outside convex and roofing over the wide spaces. Cheeks with 3 large, scale-like plates of silvery lustre, separated by a straight ridge from preopercle, the hindborder of which is slightly concave. Teeth in jaws minute in narrow villiform bands. No mandibulary barbel. About 17 short spiny gillrakers; base of fourth branchiostegal ray broadened. Scales with series of minute spines; about 3 series between first dorsal and lateral line. Second dorsal spine smooth; its length about equal to pectorals and to outer ventral ray, which reaches far on anal. Origin of these three fins nearly

in the same vertical. Interdorsal space less than length of head. Colour in alcohol, head more or less silvery; membrane between mandibles with about 20 more or less regular black transverse ridges. Area between isthmus, anus and pectorals silvery with blackish striae, a copper-coloured patch midway between lens-like organ and isthmus excepted; trunk with darkbrown back; fins hyalin. Length 176 mm. [Type seen by us in Amsterdam Museum].

Habitat: Bali Sea 538 M.!.

4. Hymenocephalus lethonemus Jord. & Gilb.

Hymenocephalus lethonemus Jordan & Gilbert, in Jordan & Starks, Bull. U. S. Fish. Comm. (1902), 1904, p. 615.

Hymenocephalus lethonemus M. Weber, Siboga-Expedit. Fische, 1913, p. 167.

Hymenocephalus nascens Gilbert & Hubbs, U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 535.

B. 7; D¹. II. 10; A. 85—107; P. 12—14; V. 12—13 (rarely 11).

Body very slender, its height 6.3 to 8. Head 5.4 to 6.1 in length, its sides vertical, the rostro-dorsal profile convex, snout declivous, ending in a median point, which is conspicuously produced before frontborder of intermaxillaries. From the median point to middle of interorbital space a ridge is continued which surpasses the low supraorbital ridges. They are low and connected with a lateral prominence on snout. Snout 3.4 to 4 in head. Eye 3.5 to 3.7 in head, 1.5 to 1.7 in postorbital part of head and 1.1 to 1.3 in nearly flat interorbital space, which goes 2.9 to 3.1 times in head. Middle of length of head in vertical through hindmargin of pupil. Mouth inferior; jaws nearly horizontal, the lower included in upper jaw, the angle of which conspicuously exceeds hindborder of eye and is two-fifths shorter than head. No barbel. Minute teeth in bands in jaws. Seventeen short spinous gillrakers. Scales very caducous, armed with weak spinules; 3 between first dorsal and lateral line. First dorsal, with the second spine smooth, its length surpasses length of pectoral but equals filamentous outer ray of ventral, which reaches far on anal. Origin of these three fins about in the same vertical. Interdorsal space nearly equal to head. Ventral striation moderately developed. Colour in alcohol: head, abdomen and sometimes lower half of tail silvery, dorsal surface of back and tail light, a dark longitudinal band separating them from remaining body, which is sprickled with black, especially the tail; base of rays of

second dorsal and anal with black spot, anterior margin of jaws, the area between isthmus and ventrals, marginal part of branchiostegal membrane black; mouth and branchial region light; fins hyalin. In some specimens of the same place the black parts are copper-coloured, forming almost a golden variety. Length 160 mm.

Habitat: Bali Sea 538 and 694 M.!; Flores Sea 521 M.!; Ceram Sea 567 M.!; Halmahera Sea 798 M.!; Between Halmahera and Makian Island 497 to 526 M.; Vicinity of Sibuku Bay, Borneo 260 to 347 M. — Philippine Islands, China Sea, Japan 183—773 M.

Note. GILBERT & HUBBS (l. s. c.) say about their new species: "The large number of specimens of the *lethonemus* type in the collection from the Philippine and East Indian Islands has made possible a very close comparison of them with typical *H. lethonemus* from Japan [1]). A single difference has been disclosed; namely, an increased average number of ventral rays. We regard *nascens* as a species rather than as a subspecies because there is no evidence at hand of the intergradation of the two forms." We are no more able to discover any other difference and feel therefore not authorized to separate the specimens from the Archipelago specifically from those from Japan, known as *H. lethonemus* Gilb. & Hubbs.

4. **Malacocephalus** Günther.

(GÜNTHER, Cat. Brit. Mus. Fishes IV. 1862, p. 396).

Head without prominent ridges, with wide muciferous cavities; the suborbital ring not reaching praeoperculum. Snout short, obtuse, obliquely truncate. Mouth wide, terminal, lateral. Intermaxillary teeth biserial, the anterior larger, mandibulary teeth uniserial. Mandibulary barbel present. Seven branchiostegals. Gillmembranes broadly united, free from isthmus. No pseudobranchiae. Four gills, a slit behind the fourth. Gillrakers on lower limb of second arch tubercular, fewer than 15. Scales small, armed with erect spinules. Lateral line originating at upper angle of gillcleft. Spine of first dorsal rounded, without serration. Second dorsal with rather weak rays, indistinctly

1) JORDAN and GILBERT, Bull. U. S. Fish Comm. 1902 (1904), p. 615, text figure; GILBERT and HUBBS, Proc. U. S. Nat. Mus. vol. 51, 1916, p. 188.

originating at some distance of first dorsal. Anal begins below first dorsal, its rays are stronger and much longer than those of second dorsal. Pectorals rather short, inserted high up, below origin of first dorsal. Ventrals short, situated below pectorals. Anus remote from anal, situated at the end of a naked area, which is separated by a narrow scaly stripe of skin from a similar naked area between the bases of ventrals;

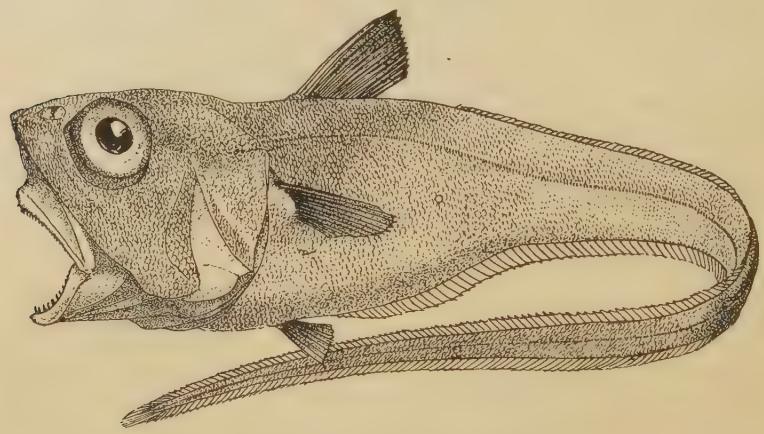

Fig. 13. *Malacocephalus laevis* (Lowe).

both areas seem to be wanting in young specimens. Pyloric caeca numerous, profusely branched. Size rarely exceeding 500 mm.

Distribution: Atlantic from 57° N., Cape Verde Island and Mediterranean deep waters off the South African coast; tropical Indic and Pacific from Bering Sea to Sandwich Islands in depths from 78 to 1606 M.

1. **Malacocephalus laevis** (Lowe). [Fig. 13].

Macrurus laevis Lowe, Proc. Zool. Soc. London 1843, p. 92.
Malacocephalus laevis Günther, Cat. Brit. Mus. IV. 1862, p. 397.
Malacocephalus laevis Lütken, Vidensk. Medd. nat. Foren. Kjöbenhavn 1872, p. 1.
Malacocephalus laevis Winther, Prodrom. Ichthyol. Danic. marin. Naturhist. Tidsskr. R. 3, V. 12, 1879—80, p. 36.
Macrurus laevis Günther, Challenger Reports XXII, Deep-Sea Fishes 1887, p. 148.
Malacocephalus laevis Hilgendorf, Die Fische der Azoren, Arch. f. Naturgesch. 1889, p. 211.
Macrurus laevis Alcock, Ann. Mag. Nat. Hist. (6) IV. 1889, p. 398. — l.c. (6) VIII. 1891, p. 123.
Malacocephalus laevis Lilljeborg, Sveriges och Norges Fauna v. 3, Fiskarne 1891, p. 273.

Macrurus (Malacocephalus) laevis Carus, Prodrom. Faun. Mediterr. 1889—93, Vol. 2, p. 583.
Macrurus laevis Smit, Hist. Scandin. Fish. by Fries, Ekström & Sundevall, II. 1893—95, p. 593.
Malacocephalus laevis Goode & Bean, Oceanic Ichthyology 1895, p. 415.
Macrurus laevis Koehler, Résult. Sci. "Caudan", Poissons Fasc. III. 1896, p. 492.
Macrurus (Malacocephalus) laevis Alcock, Descr. Cat. Indian Deep-Sea Fishes, 1899, p. 119.
Macrurus (Malacocephalus) laevis Brauer, Tiefsee-Fische, Valdivia, 1906, p. 270.
Malacocephalus laevis M. Weber, Siboga-Exped. Fische, 1913, p. 166.
Malacocephalus laevis Gilbert & Hubbs, U.S. Nat. Mus. Vol. I. 1920, Bull. 100, p. 543.
Malacocephalus laevis Barnard, Ann. South African Mus. XXI, 1925, p. 344.

B. 7; D¹. 12—13; A. ca. 190; P. 16—17; V. 8—9.

Dorsal profile of head nearly straight, 5.4 to 5.8 in length. Depth below origin of first dorsal equals head without snout. Eye 3.3 to 3.6 in head, 1.4 to 1.6 in its postorbital part and about equal to flat interorbital space. Snout bluntly pointed, with a hardly distinguishable median point projecting obliquely beyond mouth; the distance of its tip to intermaxillaries 4 to 4.8 in head. Mouth wide; the upper jaw, which is contained 2 to 2.2 times in length of head, reaches hindborder of eye or nearly so. Mandibulary barbel equal to eye or somewhat less. In the outer intermaxillary series there are about 12 or more enlarged curved teeth, in the lower series about 6—10. Scales on head very small and rough, those on body deciduous, small, densely covered with short spines; about 14—16 scales between lateral line and end of first dorsal. They are wanting on throat and branchiostegal membranes, as also on a longitudinal spot before anus and on a transverse lensshaped spot between base of ventrals. Second dorsal spine rounded, smooth, its length about equal to that of pectorals, which is conspicuously more than half length of head. Origin of ventrals slightly behind that of pectorals, their length about equal to diameter of eye; the outer ray with a filamentous end is slightly prolonged. Anus situated in middle of the distance between origin of anal and base of ventrals, which distance is about a fifth of the length of the head; the anus lies at the end of an oval naked area. The similar naked area between the bases of ventrals has its long diameter transverse. Colour brown, first dorsal, pectorals, ventrals and belly blackish, the last with a silvery hue. Length of asiatic specimens 365 mm.

Habitat: Flores Sea 521 and 694 M.!; Makassar Strait 450 M.!; Molucca Passage 397 M.!. — Andaman Sea 188—419 M.,

Gulf of Bengal 362 M., Arabian Sea 1315 M., East Africa south to East London 628—977 M., Atlantic between 57° 20′ N. and Cape Point in 78—700 M.

Note. This species is closely related to *Malacocephalus hawaiiensis* Gilbert, (Bull. U.S. fish. Comm. XXIII. P. II, (1903) 1905, p. 677), but differs by a flat interorbital space, pectorals conspicuously longer than half length of head, with 16 to 18 rays and by the diameter of the eye, which is equal to or less than two-thirds of the postorbital part of the head. In *M. hawaiiensis* the interorbital is convex, the pectorals half as long as the head, with 19—20 rays and the diameter of the eye is more than two-thirds of the postorbital part of the head.

5. **Ventrifossa** Gilbert & Hubbs.

(Gilbert & Hubbs, U. S. Nat. Mus. Vol. I. 1920, Bull. 100, p. 543).

Size not exceeding 500 mm. Head and body compressed; the sensory canal-system of head well developed, but otherwise than in *Hymenocephalus*, the canals having a stronger

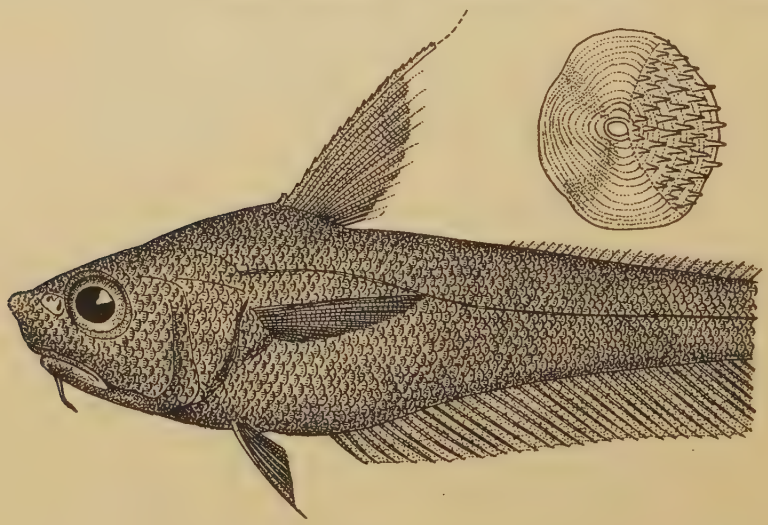

Fig. 14. *Ventrifossa nigrodorsalis* Gilb. & Hubbs. [After Gilbert & Hubbs].

bony framework and thicker membranes covered by firm scales. Snout short, broadly triangular from above, the anterior profile subvertical, not much projecting beyond frontborder of mouth and without enlarged median or lateral tubercles. Sub-

orbital ridge more or less pronounced, not extending to preopercle, not angulated, other ridges wanting. Eye circular or slightly oval. Mouth rather large, subterminal, length of upper jaw more than one-third length of head, reaching to or behind middle of eye. Mandibular barbel present. Branchiostegals 7, rarely 6 or 6 and 7. Gillmembranes unite below orbit, scarcely adnate to isthmus. About 13 to 15 short, spiny gillrakers. Villiform teeth in bands on jaws, the outer row in intermaxillaries more or less enlarged. Scales imbricate, covered with spinules, arranged in parallel rows or in quincunx order. Anus just behind base of ventrals, preceded by a naked fossa in middle of that base. Two lens-like organs as in *Hymenocephalus*; the smaller between base of ventrals, the larger in a naked area immediately before anus, may be developed. First dorsal, pectorals and ventrals in the same vertical, or the ventrals somewhat forward, their outer ray more or less filamentous and prolonged. Second dorsal spine with pronounced or obscure sharp spinules. Origin of anal below end of first dorsal.

Distribution: Tropical and subtropical parts of oceans, especially of Indic and Pacific, in depths from 200 to 1020 M.

Key to the indo-australian species of Ventrifossa.

1. Two lens-like organs, the smaller between ventrals, the larger in a naked area immediately before anus. Spinules on scales in parallel rows . . . . . *V. nigromarginata* p. 66.
2. No lens-like abdominal organs, a scaleless fossa between ventrals. Spinules on scales arranged in quincunx order.
   a. Scales along edge of gillopening and immediately behind first dorsal spineless and enlarged. Suborbital width much narrower than pupil. 6—7 scales between end of first dorsal and lateral line. First dorsal with a black spot. . . . . *V. petersoni* p. 67.
   b. No spineless and enlarged scales along edge of gillopening and behind first dorsal; 7—9 scales between origin of second dorsal and lateral line.
      a'. First dorsal with a distinct black spot. Upper jaw extending to below hindborder of pupil. Suborbital width nearly equal to pupil . . . . *V. nigrodorsalis* p. 68.
      b'. First dorsal without a black spot. Upper jaw extending a little farther than orbit. Suborbital width narrower than pupil. . . . . *V. divergens* p. 69.

1. Ventrifossa nigromarginata (Smith & Radcl.).

Macrourus nigromarginatus Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 114.

Lionurus nigromaculatus Gilbert & Hubbs, Proc. U. S. Nat. Mus. LI. 1916, p. 145, 192 (misprint).

Ventrifossa nigromarginata Gilbert & Hubbs, U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 552.

B. 7; D^1. II. 10; D^2. about 110; A. about 100; P. 20; V. 10.

Head 5.64 in total length, 1.40 in distance from tip of snout to anal, rather blunt anteriorly, compressed, breadth about 0.5 its length, bones rather firm, ridges inconspicuous; body arched, compressed, greatest depth at origin of dorsal 6.20 in total length; vent just behind base of ventrals; tail short, tapering; eye 3.08 in head, subcircular, longer than snout; interorbital 4, flattened; snout 3.64, short, blunt, rounded, projecting but little beyond mouth, its height at tip about 0.8 diameter of eye; mouth of moderate size; maxillary 2.67, reaching vertical from middle of eye; teeth of moderate size, subconical, outer row in upper jaw enlarged, barbel stout, 0.8 diameter in length. Scales small, about 12 from origin of dorsal to and including lateral line; exposed portion of each scale armed with long, slender spinules, normally arranged in about 6 to 8 nearly parallel rows; lateral line prominent, arched anteriorly, becoming median above tenth anal ray [1]). Tip of snout to origin of dorsal 5.15 in total length; second dorsal spine as long as head, armed with about 15 spinules; interdorsal space 1.45 in head; origin of anal behind base of first dorsal, its anterior rays as long as eye, much better developed than those of second dorsal; outer ventral ray 1.68 in head, not greatly produced beyond adjacent rays; pectoral 1.60. Colour in alcohol: ground colour light clay; region below pectorals blackish underneath; scales of this region smooke-gray; dorsal spines and anterior rays dusky black, posterior rays straw-coloured; anal straw-coloured; distal half of first 7 rays black; tips of anterior ventral rays blackish, remaining rays dusky; pectoral dusky, axil blackish. Length 180 mm. [After Smith & Radcliffe, not seen by us].

Habitat: Flores Sea 329 M.; vicinity of Darvel Bay,

1) After Gilbert & Hubbs (1920, p. 553) there are two lens-like organs, closely resembling those of *Hymenocephalus*; the smaller one lies between the ventrals, the larger one is situated in a naked area immediately before anus.

Borneo 296 M.; vicinity of Sulu and Tawi Tawi Islands 294—581 M. — Philippine Islands 247—717 M.

2. Ventrifossa petersoni (Alc.).

? *Macrurus (Chalinurus) hispidus* Alcock, Ann. Mag. Nat. Hist. 1889, p. 397. — Illustr. Zoology Investigator, Fishes, Pl. XIII, Fig. 2.
Macrurus petersonii Alcock, Ann. Mag. Nat. Hist. 1891, p. 121.
Macrurus petersonii Alcock, Journ. Asiat. Soc. Bengal LXIII, 1894, p. 127. — Illustr. Zoology Investigator, Fishes, Pl. III. Fig. 5.
Macrurus(Macrurus) Petersonii Alcock, Descr. Cat. Indian Deep-sea fishes 1899, p. 110.
Macrurus (Macrurus) Petersoni Brauer, Tiefseefische, Valdivia Exped. 1906, p. 260.
Macrurus Petersoni M. Weber, Siboga-Exped. Fische, 1913, p. 156.
Ventrifossa petersonii Gilbert & Hubbs, U.S. Nat. Mus. vol. I, 1920, Bull. 100, p. 544.

B. 7 (by exception 6); D[1]. II. 9—10; A. ca. 135; P. 18—22; V. 8—9.

Height 5.6 to 6; head 4.3 to 4.5; rostro-dorsal profile sloping down from elevated base of first dorsal nearly in a straight line to point of snout, which projects somewhat beyond front-border of mouth. Snout about equal to diameter of eye and 3.6 to 4 in head; the median tubercle not much pronounced, more so in young specimens. Eye circular, 3.3 to 4 in head, according to size of specimen, and slightly more than interorbital space. Mouth large, upper jaw reaching behind middle of eye, about 2.4 in head. Barbel equal to eye or only half its length. Suborbital ridge nearly wanting, suborbital area very narrow, about 4 times in eye. Branchial opening extends to below preopercular rim, which is vertical as also the hind-margin of preopercle, with rounded prominent angle. Villiform teeth in a broad band in upper jaw with the outer row considerably enlarged; lower jaw with a narrow band. Scales not very densely covered with about 15—30 sharp, conical, semi-erect spinelets, in a shallow, quincuncial arrangement, some of which project beyond the edge of the scale. Six or seven rows of scales between last ray of first dorsal and lateral line. Scales along edge of gillopening and immediately behind first dorsal, where they are enlarged, spineless. Anus immediately behind base of ventrals. Second dorsal spine serrate, two-thirds length of head. Interdorsal space about half length of head. Outer ventral ray not much prolonged [1]) and not much more

1) In Alcock's figure it is prolonged.

than two-fifths of head; pectorals equal to postorbital part of head or longer; origin of first dorsal and pectorals in the same vertical; ventrals somewhat behind it. Colour in alcohol brown, with an underlying silvery lustre, head silvery; belly black; first dorsal black, with yellowish base and tip. Length 388 mm.

Habitat: Madura Sea 289 M.!; Flores Sea 521, 538 and 694 M.!; Arafura Sea 560 M.!; Banda Sea 4391 M.! (though the specimen was obtained in this haul, very probably it was caught in much less deep water while the net was hauled in); Macassar Strait 450 M.!; West-coast of Sumatra 371 and 470 M. — Andaman Sea 338 to 366 M., Nicobars 296 M., East coast of Africa 628 to 1019 M.

3. **Ventrifossa nigrodorsalis** Gilb. & Hubbs. [Fig. 14, p. 64].

Ventrifossa nigrodorsalis Gilbert & Hubbs, U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 546.

B. 7; D^1. II. 10 (9—11); P. 20 (17—23); V. 8 (8—9).

Depth below elevated origin of first dorsal 1.1 in head, being more than twice the greatest width of body. The horizontal projection of the snout beyond the intermaxillaries is equal to the length of the pupil; preocular length of snout 3.7; preoral length 2.6 in postorbital. The orbit almost round, 3.4 in head, 1.6 in postorbital; interorbital width 1.25 in orbit, 2 in postorbital. Suborbital width nearly equal to diameter of pupil. The oblique preopercular ridge not produced backward at its angle. Mouth a little oblique, comparatively large, upper jaw extending almost to vertical from posterior margin of pupil, 2.6 in head. Length of barbel about two-thirds that of snout. Branchial aperture extends to below hindmargin of orbit. Outer intermaxillary series of teeth little enlarged. Scales with numerous fine spinules, close-set in quincunx order; 7—9 rows of scales between origin of second dorsal and lateral line series. Anus just behind ventral fins. A small fossa in middle of ventral bases. Second dorsal spine sharply denticulate along its entire length, about one-sixth shorter than head. Ventrals inserted a little in advance of pectorals. Colour in alcohol, brown, becoming darker below first dorsal and blackish on belly; ridges and margins of head mostly dark; jaws whitish at corner of mouth. First dorsal dusky, with a black median spot; pectorals dark dusky, black on their base and axil; ventrals

blackish, sometimes lighter either proximally or distally. Length 220 mm. [After GILBERT & HUBBS, not seen by us].

Habitat: Vicinity of Sibuku Bay, Borneo 475 to 759 M.; between Halmahera and Makian Islands 503 and 526 M., between Halmahera and Kajoa Island 421 M. — Philippine Islands 291—700 M., China Sea, vicinity of Formosa 421 M.

4. Ventrifossa divergens Gilb. & Hubbs.

Ventrifossa divergens Gilbert & Hubbs, U.S. Nat. Mus. vol. I, 1920, Bull. 100, p. 549.
Ventrifossa divergens Barnard, Ann. S. African Museum, XXI, 1925, p. 346.

B. 7; D^{1}. II. 10 (9—11); P. 21—23; V. 8—9.

Greatest depth of body below elevated origin of first dorsal 1.25 in head; greatest width half its depth. Snout broadly triangular when viewed from above; viewed from the side it projects forward beyond the mouth a distance equal to diameter of pupil; its preocular length 3.8 in head; preoral length one-third postorbital. There are no enlarged median or lateral rostral tubercles. The slightly oval orbit greater than snout, 2.9 to 3.4 in head, 1.4 in postorbital. Least width of flat interorbital space 1.2 in orbit, 1.8 in postorbital. The ridge and margin of preopercle extend downward and backward, but are not sharply produced backward behind their general course at their angle. Suborbital width narrower than pupil. Mouth very large and a little oblique, length of upper jaw, which extends backward a little farther than orbit, 2.3 in head. Barbel about 4 times in head. Branchial aperture extended forward to below hindmargin of orbit. Thirteen to 15 short, spinous gillrakers. Anus just behind base of ventrals; it is preceded, after a scaly interspace, by a very small naked spot or fossa. Scales with numerous fine spinules arranged in quincunx order, 7 to 9 rows between lateral line series and front of second dorsal. The gular and branchiostegal membranes scaleless. The numerous and fine denticulations of the second dorsal spine sometimes obscure proximally. Origin of ventrals in the same vertical as that of pectorals or a little forward. Second ventral ray extends to origin of anal. Colour in alcohol, silvery on the sides, brown on the back, becoming darker anteriorly; blackish on the under surface of trunk and head and on the jaws, which however are whitish about the corners of the mouth. There is a dark streak along the front margin of the snout, and another at the occiput. First dorsal dusky proximally, but

without deep black spot; base and axil of pectorals black; ventrals dusky, becoming blackish proximally or totally. Length 270 mm. and more. [After GILBERT & HUBBS, not seen by us].

Habitat: Sibuku Bay, Borneo 567 M.; between Halmahera and Makian 545 M. — Vicinity of Luzon and Panay 362—772 M.; China Sea, vicinity of Hongkong 183 M.; Off east London, South Africa 540—720 M.

6. **Lionurus** (Günther) Gilbert & Hubbs [1]).

(GÜNTHER, Deep-Sea Fishes, Challenger Reports XXII, 1887, p. 124, 141 modified by GILBERT & HUBBS, Proc. U. S. Nat. Mus. LI. 1919, p. 192 and U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 553).

Size below 500 mm., body slender or robust, tail may be long and filamentous; head rather firm, the sensory canals comparatively little developed. Snout conical and projecting beyond frontborder of mouth, or usually with the anterior profile subvertical and scarcely projecting; the top with a median and two lateral spiny tubercles, or with the median or the two lateral only or without tubercles. Suborbital ridge usually not strongly marked, not extending to preopercle and not angulated, other ridges wanting. Eye circular or more or less oval. Mouth small, subinferior, upper jaw less than one third length of head, not surpassing eye. Mandibulary barbel present. Branchial opening extending to below orbit, gillmembranes therefore only shortly united, without a free posterior fold and scarcely attached to isthmus. Branchiostegals 7. Gillrakers reduced to about 7 tubercles. Anus equidistant from origin of anal and base of ventrals, rarely nearer to anal. Villiform teeth in bands in jaws, those of the outer row may be enlarged. Scales imbricate, small, armed with longer or shorter spinules irregularly arranged or in rows or in quincunxial order; those on head smaller and sometimes reduced to spinulated tubercles. Lateral line more or less conspicuous. Second dorsal spine

1) BLEEKER (Versl. Med. Akad. Amsterdam (2) VIII. 1874, p. 369) has created the genus *Macruroplus* based on *Macrurus serratus* Lowe from Madeira, the type of which is lost. According to GÜNTHER the diagnosis of LOWE is too short to decide if it corresponds with *Macrurus aequalis* Gthr. or one of the related species belonging after GILBERT & HUBBS to *Lionurus*. If *Macrurus serratus* Lowe could be identified and belonged to *Lionurus*, the name *Macruroplus* has the priority and must replace *Lionurus*. The name *Macruroplus* is again used by BLEEKER — with a query — for *Coryphaenoides leptolepis* Gthr. from Brazil, by BLEEKER erroneously named from Japan (Verh. Akad. Amsterdam XVIII. 1879, p. 21).

serrate; ventrals with the outer ray filamentous, their origin behind head, by exception below it; origin of anal behind first dorsal or below it.

Distribution: represented in the tropical and temperate part of all oceans, even to the Antarctic Ocean in depths between 110 and 4846 M.

Fig. 15. *Lionurus fasciatus* (M. Web.) n. s.

Note. The subgenus *Lionurus* was created by GÜNTHER for those species of *Macrurus (Coryphaenoides)* which have smooth scales. Generic rank was assigned to it by GILBERT & HUBBS, while including in it the majority of species, which are related to *Coryphaenoides (Macrurus)* but differ from that genus by seven branchiostegal rays, a small mouth, short upper jaws, gillmembranes without a posterior free fold, narrowly joined and scarcely attached to isthmus, position of anus remote from anal and small size not reaching 500 mm. length. Though it may be a rather artificial genus, it is in the present state of our knowledge a convinient help to arrange the very numerous species of *Coryphaenoides* and *Lionurus* in minor groups naturally linked together. The species included in the genus *Lionurus* in the wider sense of GILBERT & HUBBS, contain two extreme groups radiating from a central stock of species

with a rather robust body, a normal head, the snout with the anterior profile subvertical or scarcely projecting beyond the mouth, the branchial membranes united below rim of preopercle, vent about equidistant from origin of anal and base of ventrals; anal inserted behind first dorsal, ventrals behind head. This central group contains species with smooth scales (*Lionurus* Günther in specie) and the great bulk of those with spinulated scales (*Nezumia* Jordan). From this central group radiate at one side the species with an elongate head, a slender body, a conical, projecting snout and few ventral rays. At the other side the species with a strongly shortened head, with the ventral parts migrated forward so that the branchial opening is extended to below orbit, where the branchial membranes join, the origin of ventrals is located below middle of opercle, that of anal below first dorsal and the anus much nearer anal than base of ventrals. These modified forms are represented in the Archipelago by *L. richardi, parvipes* and *pumiliceps*. The group with spineless scales (*Lionurus* Gthr.) is wanting as also the slender forms with conical snout. The representatives of *Lionurus* in the Archipelago belong to *Nezumia* Jordan.

Key to the indo-australian species of Lionurus.

1. Head normal; gillmembranes united below preopercular ridge. Ventrals inserted behind head. Origin of anal behind first dorsal. Vent about equidistant from origin of anal and base of ventrals.
   a. Length of upper jaw and of diameter of eye less than thrice in head. Pectorals with 15—16 rays. Snout with three prominent spiny tubercles. . . . . *L. fasciatus* p. 73.
   b. Length of upper jaw 3.25, of diameter of eye 3.6 in head. Pectorals with 21 rays. Snout without prominent tubercles . . . . . *L. infranudis* p. 74.
   c. Length of upper jaw 4 4, diameter of eye thrice in head. Pectorals with 20—22 rays. Snout with two prominent spiny tubercles. . . . . *L. evides* p. 75.
2. Head shortened, its ventral part migrated forward, gillmembranes unite therefore below orbit, ventrals inserted below middle of opercle. Origin of anal below first dorsal. Vent much nearer to anal than to base of ventrals.
   a. Six ventral rays. First dorsal II.8. Eye 4.8 in head. *L. parvipes* p. 75.

b. Eight ventral rays. First dorsal II, 10. Eye 2.8 in head. *L. richardi* p. 76.

c. Eleven to 13 ventral rays. First dorsal II, 12—13.
Eye about 3 in head . . . . . *L. pumiliceps* p. 78.

1. Lionurus fasciatus (M. Web.). [Fig. 15, p. 71].

Macrurus fasciatus M. Weber, Siboga-Exped. Fische, 1913, p. 157.
Macrurus vittatus M. Weber, Siboga-Exped. Fische, 1913, Taf. I. Fig. 5. (Misprint for *M. fasciatus* M. Web.).
Lionurus vittatus Gilbert & Hubbs, U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 559.

B. 7; D[1]. II. 9; A. ca. 90—95; P. 15—16; V. 10—11.

Head about 5.6 in length; rostrodorsal profile nearly straight. Snout 5.1 in head, 4.2 in smaller specimen, bluntly rounded, scarcely projecting beyond frontborder of eye, a median tubercle almost wanting, about one third shorter than eye, which is circular and goes 2.8 to 3 in head. Interorbital space flat, smaller than eye and 3.8 in head. Prominent ridges on head wanting. Rim of preopercle straight, its angle rounded as also hindborder of opercle. Jaws nearly horizontal, the upper extending to about vertical through hindmargin of pupil, 2.5 to 2.8 in head, the lower included. Minute teeth in bands on jaws, those of the outer series conspicuously elongate. Barbel 1.3 to 1.7 in eye. Scales small, on trunk and tail with about 8—12 spinules, irregularly arranged, lower in anterior part of body; less numerous but longer and more projecting beyond hindborder of scale on posterior part. Those on head and opercle smaller with lower spinules arranged in rows. Eight series between end of first dorsal and lateral line, which is conspicuous and curved above pectoral. Vent nearer to base of ventrals than to anal. Origin of pectoral and ventral in the same vertical, conspicuously before that of first dorsal. Its second spine stout, longer than head, with 12 to 18 sharp spines. Outer ventral ray somewhat prolonged, reaching on anal. Second dorsal very low, its distance from end of first dorsal equal to head without snout. Origin of anal below first dorsal. Colour in alcohol lighter or darker brown; belly darker, as also the stripes which are partly nearly black. The first oblique band runs from opercle to behind first dorsal, the second transverse band between anterior part of second dorsal and anal, upon which it is continued; the following transverse bands are less conspicuous and principally indicated by opposite blackish pigmentation at the base of dorsal and anal. First dorsal black

with a light frontborder and a light patch above base. Initial part of anal and ventrals black. Length 130 mm.

Habitat: Madura Sea 289 M.!; Arafura Sea 204 M.!

2. Lionurus infranudis Gilb. & Hubbs.

Lionurus infranudis Gilbert & Hubbs, U.S. Nat. Mus. vol. I, 1920, Bull. 100, p. 555.

B. 7; D¹. II. 12; P. 21; V. 11.

Body rather slender, the dorsal contour sloping forward in a gentle convex curve from the elevated origin of first dorsal to subconic snout, the tip of which bears two rather prominent spiny tubercles. The horizontal projection of snout beyond the front of intermaxillaries equal to length of pupil; preocular length, about 0.2 longer than preoral length and equal to height of orbit, is contained 3.33 times in head. Orbit not quite round, the vertical diameter being a little greater than its horizontal length, which is contained 1.55 in postorbital, or 3.6 in length of head. The margin and ridge of preopercle not sharply produced backward at the angle, above which they are vertical. Least width of narrow interorbital space contained 1.4 in orbit, or 2.2 in postorbital; the suborbital narrower than pupil. Length of upper jaw, which extends backward to below posterior half of pupil, contained 3.25 in head. Teeth in bands, that of upper jaw having an outer series a little enlarged. Length of barbel equal to interorbital width. Gillmembranes unite in a free fold directly below preopercular ridge. The scales are armed by numerous rather long spinules arranged in quincunx order; the last spinules project beyond margin of scale. Underside of head naked. Nine rows of scales separate origin of second dorsal from lateral line series. Anus about equidistant from the origin of anal and base of outer ventral ray, it is preceded by a naked area. Second dorsal spine longer than distance between tip of snout and origin of anal; the basal half of the spine armed with 11 widely spaced denticulations. Pectorals and ventrals inserted on the same vertical. Inner ventral rays, when depressed, fall short of the origin of anal. Colour in alcohol, gray-brown, becoming blackish on the belly, opercles and nasal fossa; pale on the jaws and underside of snout. All of the fins, excepting the second dorsal, are black. The buccal and branchial cavities are lined with black, without light margins except along the bands of teeth

and at the corners of the mouth; the parietal peritoneum is brownish black laterally, but silvery with black spots ventrally (except about anus). Length 203 mm. (pseudocaudal). [After GILBERT & HUBBS, not seen by us].

Habitat: Sibuku Bay, Borneo 635 M.

3. Lionurus evides Gilb. & Hubbs.

Lionurus evides Gilbert & Hubbs, U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 557.

B. 7; D[1]. II. 9—13; P. 20—22; V. 11—15 (usually 13—15). Body deep and elevated at origin of first dorsal, from which point the dorsal contour extends forward as a convex curve to occiput, thence straight to the subconic snout, which projects beyond the front of the intermaxillaries, half its horizontal projection beyond the eye. The tip of snout bears two rather prominent spiny tubercles; preocular length of snout 3.25 in head; preoral length 4; length of orbit 3. The least interorbital width nearly equal to length of orbit; the suborbital is wider than pupil. The upper jaw extends backward to below posterior margin of pupil; its length contained 4.4 in head. The gillmembranes unite below preopercular ridge. The scales are armed with about 10 slightly divergent rows of spinules; there are 8 to $9^1/_2$ series between origin of second dorsal and lateral line scales. Center of anus a little nearer to origin of anal than to insertion of ventrals. Second dorsal spine, which is strong basally, is armed with 12 (9 to 15) rather large and well-spaced denticulations. Colour in alcohol, light brown, becoming blackish, with a silvery sheen, on the opercles and over the coelomic cavity. The buccal and branchial cavities are lined wholly with blackish except near the corners of mouth and along edge of the opercular and branchiostegal membranes. Length 164 mm. [After GILBERT & HUBBS, not seen by us].

Habitat: Sibuku Bay, Borneo 475 M.; between Halmahera and Makian Island 545 M.

4. Lionurus parvipes (Smith & Radcl.).

Macrourus parvipes Smith & Radcliffe, in Radcliffe Proc. U. S. Nat. Mus. XLIII. 1912, p. 124.

Lionurus parvipes Gilbert & Hubbs, Proc. U. S. Nat. Mus. LI. 1916, p. 205. — U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 562.

B. 7; D¹. II. 8; P. 17—19; V. 6.

Body rather robust, short, compressed, greatest depth at origin of dorsal 1.8 in distance between tip of snout and origin of anal; tail very long, strongly compressed, filamentous. Head 1.31 in distance from tip of snout to anal, short, slightly arched, not as wide as deep, bony framework not very firm; suborbital ridges and rostral edges sharp, prominent. Eye 4.08 in head, small, subcircular, interorbital 3, broader than eye, slightly arched; snout 2.75, very high and broad, a distinct angulation on sides; from point of angulation the snout narrows rapidly, tip pointed. Mouth rather small, well forward, an eye diameter from tip of snout; maxillary 3.6—4 in head, scarcely as long as distance between tips of maxillaries posteriorly. Barbel minute, scarcely as long as pupil. Vent immediately in front of anal. Teeth small, villiform, in bands, narrowing posteriorly, outer row of teeth in upper jaw scarcely enlarged. Scales small, 10—12 from origin of dorsal to and including lateral line, each scale armed with about 15 slender spinules not very regular in their arrangement, spinules of scales of head much longer than those on body; underside of head scaled. Tip of snout to origin of dorsal 1.17 in distance to anal, first spine small, second 1.30 in head, armed with small, slender spinules; interdorsal space 3 in head; second dorsal low, not as well developed as anal; origin of anal under posterior rays of first dorsal; ventrals small, rays in reduced number, outer ray longest, about 0.33 as long as head; pectorals 2.21 in head small. Colour in alcohol: Tail and upper part of trunk wood-brown; top and sides of head hair-brown; underside of head, and body to twelfth anal ray dark clove-brown; fins dusky. Length 228 mm. [After SMITH & RADCLIFFE, not seen by us].

Habitat: Macassar Strait 2160 M.; Gulf of Tomini, Celebes 1991 and 1997 M.; Molucco Passage 2308 M.

5. **Lionurus richardi** (M. Web.). [Fig. 16, p. 77].

Macrurus richardi M. Weber, Siboga-Exped. Fische, 1913, p. 154.
Lionurus richardi Gilbert & Hubbs, U. S. Nat. Mus. Vol. I, 1920, Bull. 100, p. 559.

B. 7; D.¹ II. 10; A. ca. 120—130; P. 19—20; V. 8.

Elongate, height 6.3 to 7.1 in length. Head short 7.1 to 8.2 in length, quadrate; the snout broad, short, one-third to three-eighth shorter than eye, and 4.3 to 4.6 in head, blunt

in profile with a median blunt tubercle, proceeding as a rounded ridge to middle of interorbital space. On each side a less prominent tubercle with a rounded, arched ridge continued to superior margin of orbit. The three tubercles are armed with sharp spines; below them the profile of the snout slopes vertically down to frontborder of mouth. The suborbital area is divided by a spinous arched suborbital ridge into a superior narrower vertical portion, armed with spines and an inferior spineless portion, obliquely descending to margin of mouth. Other ridges are wanting. Eye 2.8 in head, 1.2 in postorbital part of head, its greater part located in anterior half of head.

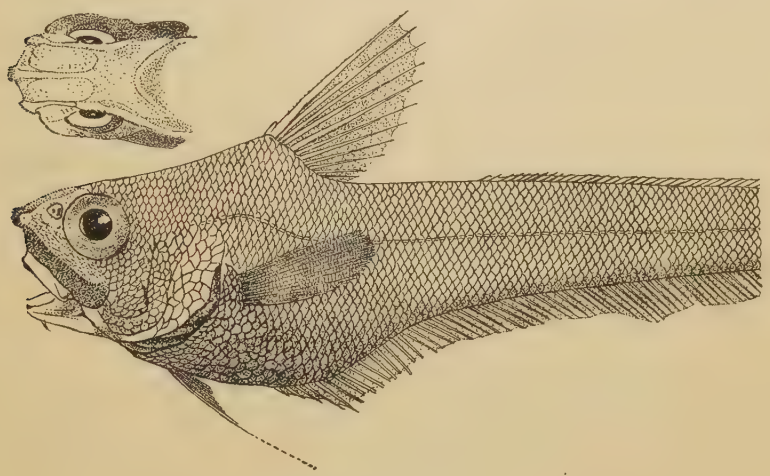

Fig. 16. *Lionurus richardi* (M. Web.). $^5/_6$ n. s.

Interorbital space slightly arched, 2.6 to 3.3 in head, somewhat shorter or longer than diameter of eye. Mouth small, inferior; upper jaw extends only to anterior third of eye. Posterior margin of preopercle and opercle rounded. Jaws with several series of somewhat elongate, curved teeth, more numerous near symphysis of lower jaw; especially the outer series elongate. Barbel about one-eighth length of head. Branchiostegal membrane deeply incised near isthmus and scarcely attached to it. Vent much nearer to anal than to base of ventrals preceded by a naked fossa. Scales with 4—7 short, parallel rows of sharp spinules; larger and projecting beyond hindborder of scales on back, shorter on tail and abdomen. Ten to 11 scales between origin of first dorsal and lateral line, 8 below

end of first dorsal. Before dorsal and on head the spinules are erect, the scales rounded or reduced to tubercles. Second dorsal spine with 20 to 50 adjacent spinulets; its length about equal to head; its distance from posterior margin of eye nearly equals length of head without snout. Origin of ventrals before that of pectorals, the insertion of which is before that of first dorsal. Filamentous outer ray of ventrals conspicuously surpasses beginning of anal. Colour in alcohol lighter or darker yellowish-brown or gray-brown; abdomen and branchiostegal membrane and ventrals blackish; in large specimens also pectorals; the other fins dark, otherwise they are light coloured. Length 215 mm.

Habitat: Flores Sea 538 and 694 M.!; Macassar Strait 724 M.!; Celebes Sea 1260 M.!; Ceram Sea 924 M.!.

6. **Lionurus pumiliceps** (Alc.).

Macrurus pumiliceps Alcock, Journ. Asiat. Soc. Bengal LXIII. 1894, p. 125, 127.
Macrurus (Macrurus) pumiliceps Alcock, Descript. Cat. Indian Deep-sea fishes 1899, p. 113.
Macrurus (Macrurus) pumiliceps Brauer, Tiefsce-Fische, Valdivia-Exped. 1906, p. 262.
Lionurus pumiliceps Gilbert & Hubbs, U.S. Nat. Mus. vol. I. 1920, Bull. 100, p. 559.
Lionurus pumiliceps Barnard, Ann. S. African Museum XXI, 1925, p. 347.

B. 7; D^1. II. 12—13; P. 20—23; V. 11—13.

Body very deep, sharply compressed posteriorly, in some specimens constricted behind the trunk much more than in others; its height equal to length of head, which is just over one eighth the total length. The major diameter of the eye almost a third the length of the head. The snout is blunt in profile, projecting but little beyond mouth, its horizontal projection half as long as pupil. Least width of the oblique suborbital a little more than half the orbital length. Preopercular ridge separated above from orbit by a distance equal to diameter of pupil; the ridge is a little arched backward at the angle. Gillmembranes united below orbit. About eight rudimentary gillrakers. Barbel decidedly more than half as long as orbit. Upper jaw a little longer than snout. Anus lies before the vertical from the origin of the first dorsal and is followed by the anal fin after an interval unusually short for a species of the *Lionurus* type. Scales rather small, being in 8 or 9 series from origin of second dorsal to but excluding the lateral line. The scales are reduced in size on upper and under sur-

faces of head; those in front of anal fin are sometimes enlarged as though vertically fused. In the larger specimens the scales of the body bear six to eight parallel or slightly divergent rows of spinules. Lateral line indistinguishable. Origin of first dorsal at the apex of a triangular elevation of the dorsal contour; its first spine sharp and robust, the second lower or little higher than length of head, armed by 16 to 37 denticulations, according to increasing size of fish. Interdorsal space very much longer than orbit. Ventrals inserted below middle of opercle. Length 275 mm. [After ALCOCK and GILBERT & HUBBS, not seen by us].

Habitat: Sibuku Bay, Borneo 759 M.; Macassar Strait 731 M.; Flores Sea 1265 M.; Gulf of Boni 900 to 1280 M.; Gulf of Tomini, Celebes 1183 and 1392 M.; Buton Strait 949 and 1022 M. — Off western and eastern Luzon 878—1646 M.; Arabian Sea, between Maldives and Travancore coast 1315 M., East coast of Africa 1242 M., Agulhas Bank 500 M.

7. Mataeocephalus Berg.

(C. BERG, Substitucion de nombres genericos II. Comun. Mus. Buenos Aires I. 1899, p. 43).

Coelocephalus Gilbert & Cramer, Proc. U. S. Nat. Mus. XIX. 1896, p. 422 (nec *Coelocephalus* L. Agassiz).

Body and tail slender and compressed; head depressed, its dorsal contour nearly straight. Snout projecting with distinct angulation, produced by a ridge, extending downward in front

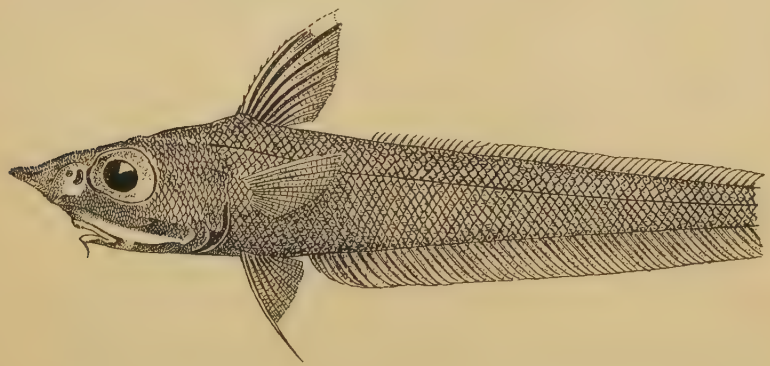

Fig. 17. *Mataeocephalus nigrescens* Smith & Radcl. After RADCLIFFE.

of nostrils and ending in a bony prominence or a bunch of spines on lateral margin of snout and dividing it in an anterior marginal portion, converging with that of the other side into

the tip of the snout, which is usually formed by a spinigerous bifid tubercle. The posterior portion is strengthened by an suborbital ridge, which extends to below hindmargin of orbit and divides the cheek into an upper, somewhat sloping and a lower nearly horizontal part. No spinous occipital ridges. Underside of head usually naked, as also area of nostrils. Mouth small, wholly inferior; upper jaw decidedly less than thrice in head. Gillmembranes unite about below the ridge of preopercle. Branchiostegals 6 to 7. Scales imbricate with spinules arranged in parallel or nearly parallel rows. Second dorsal spine usually sharply serrated. Origin of pectorals below or somewhat before origin of first dorsal; ventrals below that of pectorals; outer filamentous ray of ventrals prolonged; no naked pit between their bases. Anus immediately in front of anal.

Distribution: Tropical deep-sea fishes known from the indo-australian Archipelago, the Indian Ocean, the Philippines, Hawaiian Islands and coast of Peru; in depths from 622 to 1525 M.

Key to the indo-australian species of Mataeocephalus.

a. P. 19; V. 8. Scales with 6—10 parallel or nearly parallel rows of spinules. Underside of head partly naked. Second dorsal spine with strong, widely set, sharp-pointed spinules. *M. nigrescens* p. 80.

b. P. 16; V. 7. Scales with 18 nearly parallel rows of spinules (somewhat less in the young). Underside of head scaled. Only basal part of second dorsal spine with weak, very widely separated spinules . . . . . *M. adustus* p. 81.

1. Mataeocephalus nigrescens Smith & Radcl. [Fig. 17, p. 79].

Mataeocephalus nigrescens Smith & Radcliffe, in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 125 [1]).

Mataeocephalus nigrescens Gilbert & Hubbs, U. S. Nat. Mus., vol. I. 1920, Bull. 100, p. 563.

B. 7 [2]); D^1. II. 8; P. 19; V. 8.

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1) This species is closely related to *Macrurus microstomus* Regan (Trans. Linn. Soc. London XII. Part 3, 1905, p. 221) from Saya de Malha Bank; but — according to the figure — that species has the origin of pectorals decidedly before that of first dorsal; the distance of the end of ventral rays from anal much greater, and the interorbital width seems to be smaller.

2) According to Gilbert & Hubbs; their number is not recorded by Smith & Radcliffe. Regan gives the number 6 in his *Macrurus (Mataeocephalus) microstomus*.

Body slender, compressed, greatest depth 8.44; tail long, slender, compressed. Head 5.20 in length, depressed, rugose, dorsal contour nearly straight, oblique. Suborbital ridge salient, ending at a short distance behind vertical from posterior margin of eye. Eye irregularly subelliptical, horizontal diameter 3.47, vertical diameter 4 in head; interorbital 4.65, flat. Snout 2.75, broad, depressed, ending in a bifid tubercle. Mouth small, its distance from tip of snout 3.06 in head; mandibular barbel slender, about equal to diameter of pupil. Teeth long, slender, cardiform. Scales small, 7 or 8 in each series from origin of dorsal and from last dorsal ray to and including lateral line; spinules slender, recumbent, arranged in 6 to 10 parallel or nearly parallel rows, those on scales of head more nearly erect, giving the head a very rough appearance, especially along the lateral margins; the scales of preopercle encroach on underside of head as do those of anterior part of snout, remainder of underside of head naked. First dorsal spine small, second spine 1.5 in head, strong, slightly curved, armed with strong, widely set, sharp-pointed spinules. Interdorsal space 2.6 in head. Rays of second dorsal small, especially the anterior ones; anal well developed, its rays long and slender. Ventrals small, inner rays reaching origin of anal, outer ray filamentous 1.93 in head; pectorals 1.93. Colour in alcohol dark sepia brown, underside of throat posteriorly; belly and fins blackish. Length 270 mm. [After SMITH & RADCLIFFE, not seen by us].

Habitat: Sibuku Bay, Borneo 635 M. — Philippine Islands 1344 M.

2. Mataeocephalus adustus Smith & Radcl.

Mataeocephalus adustus Smith & Radcliffe in Radcliffe, Proc. U. S. Nat. Mus. XLIII. 1912, p. 126.

Mataeocephalus adustus Gilbert & Hubbs, U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 563.

B. 7 [1]); D. [1] II. 9; D. [2] 85 +; A. 100 +; P. 16; V. 7.

Body slender, compressed, greatest depth 7.40; tail slender, compressed. Head 4.80 in length, depressed, dorsal contour nearly straight, oblique. Suborbital ridge sharp, ending near vertical from posterior margin of eye. Eye small subelliptical,

1) According to GILBERT & HUBBS; their number is not recorded by SMITH & RADCLIFFE.

horizontal diameter 3.88 in head, interorbital 4.33, flat. Snout 2.9, broad, depressed, bifid tubercle at tip less prominent, than in related species; projection of tip beyond angulation relatively short. Mouth small, its distance from tip of snout 3.34 in head. Mandibulary barbel short, slender. Teeth slender, in narrow, cardiform bands. Scales small, regular, 7 in each series from origin of dorsal and from last dorsal ray to and including lateral line; spinules on exposed portion of scale very slender, arranged in about 18 nearly parallel rows (the number somewhat less in the young), those on head small, hairlike; underside of head scaled. First dorsal spine slender, longer than in most related forms; second spine long, slender, longer than head, 4.52 in total length, basal portion armed with several weak, very widely separated spinules; interdorsal space 2.37 in head; second dorsal low, its rays very slender; anal rays better developed than those of second dorsal. Ventrals smaller, inner rays not reaching base of anal, outer ray filamentous, 2.20 in head; pectoral 1.94. Colour in alcohol light brown, belly and opercular region blackish, fins dusky. Length 230 mm. [After SMITH & RADCLIFFE, not seen by us].

Habitat: Gulf of Boni, Celebes 1472 M.; Gulf of Tomini, Celebes 1183—1525 M.; South of Patientie Strait 1040 M. — Philippine Islands 622 to 1344 M.

8. Trachonurus Günther.

(GÜNTHER, Deep-Sea fishes, Challenger Reports XXII. 1887, p. 124 & 142).

Body greatly elongate, tapering to a very long and slender tail; strongly compressed as also head, which is short, laterally vertical and without prominent ridges. Bones of head firm,

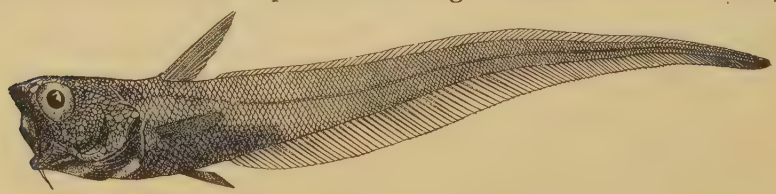

Fig. 18. *Trachonurus villosus* (Gthr.). × 0.4.

the sensory canalsystem moderately developed. Snout obtuse, short, its point nearly perpendicular above frontborder of mouth. Mouth rather small. Barbel of moderate length. Teeth in jaws

in moderate villiform bands, the anterior intermaxillary ones somewhat enlarged, or the outer series in both jaws enlarged. Branchiostegals 7. Gillmembranes broadly united below the ridge of the preopercle; gillrakers tubercular. Scales small, adherent, not imbricate, diamond-shaped, armed with long erect pointed spinules, strongest on the enlarged scales along anterior portion of base of dorsal and anal. A naked area behind pectorals, space between ventrals and anus also scaleless. Lateral line nearly straight or anteriorly with a low, dorsally convex curve. Anus remote from anal. Second dorsal spine slender, smooth; second dorsal very low. Ventrals inserted below first dorsal, their origin conspicuously behind that of pectorals. First ventral ray filamentous.

Distribution: These tropical and subtropical fishes are known from Japan, Philippines, indo-australian Archipelago, Sandwich-Islands, Martinique and Atlantic (Marocco and Açores). They are caught in depths from 414—1590 M.

1. **Trachonurus villosus** (Gthr.). [Fig. 18, p. 82].

Coryphaenoides villosus Günther, Ann. Mag. Nat. Hist. (4) XX. 1877, p. 441.
Macrurus villosus Günther, Deep Sea fishes, Challenger Reports XXII. 1887, p. 142.
Macrurus (Trachonurus) villosus Brauer, Tiefsee-Fische, Valdivia Exped. 1906, p. 268.
Trachonurus villosus M. Weber, Siboga-Exped., Fische, 1913, p. 165.
Trachonurus villosus Gilbert & Hubbs, Proc. U S. Nat. Mus. LI. 1916, p. 205 and U. S. Nat. Mus. vol. I. 1920, Bull. 100, p. 564.

B. 7; D^1 9—10; A. ca. 110—112; P. 13—15; V. 7.

Very long and slender; height more than 7, head about 5.5 times in length. Eye 3.3 to 4 in head, slightly longer than snout, which is bluntly pointed. Flat interorbital space nearly thrice in head and conspicuously broader than diameter of eye. Mouth rather small; the upper jaw extending to centre of eye or hindborder of pupil. Teeth in villiform bands, the anterior mandibulary ones slightly enlarged. Infraorbital ridge obsolete. Barbel about half length of eye or less. Scales with 10 or more long, erect sharp spines; longer along anterior part of base of second dorsal and anal; fewer in number in young specimens. Five to 6 scales between end of first dorsal and the lateral line, which forms a low convex curve anteriorly. A naked area behind pectorals as also between ventrals and anus. Anus about one third nearer to anal than to base

of ventrals. Second dorsal spine smooth, much shorter than head. Interdorsal space about equal to eye or shorter. Pectorals nearly half length of head. Outer filamentous ray of ventrals pass origin of anal. Colour in alcohol dark brown. Length 285 mm.

Habitat: Ceram Sea 567 and 924 M.!; Timor Sea 918 M.!; Northwest coast of Sumatra 1024 M.; vicinity of Sibuku Bay, Borneo, 635, 759 M.; Buton-Strait 834 and 1022 M. — Philippines 514—1344 M., South Japan 631—1187 M.

9. Cetonurus Günther.

(Günther, Deep-Sea fishes, Challenger Reports XXII. 1887, p. 124 & 143).

Head very large, its bones soft, the sensory canals greatly developed. Trunk very short, the tail rapidly constricted from it and strongly compressed. Snout excessively broad and high but short. Mouth small, inferior. Barbel minute. Teeth in jaws in villiform, narrow bands. Branchiostegals 7; gillmembranes united, gill-cavity restricted in size, gillrakers tubercular. Margin

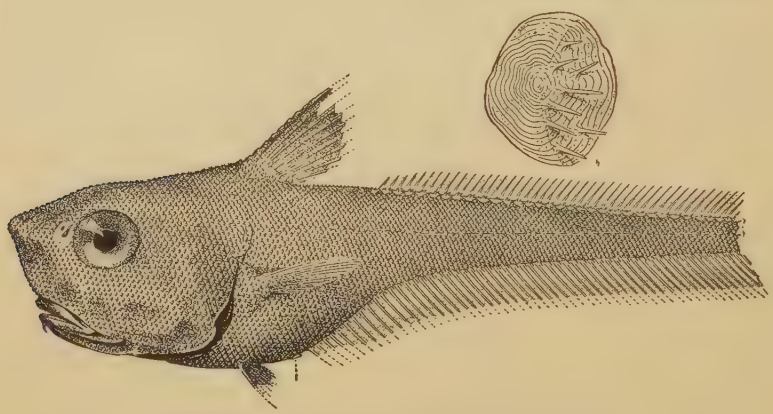

Fig. 19. *Cetonurus robustus* Gilb. & Hubbs.

of preopercle adnate to interopercle. Scales small, studded with long, fine suberect or curved spinules. A series of enlarged and modified scales along each side of base of second dorsal, they may be present also along anterior base of anal. Lateral line consisting of widely spaced pores, without a well-marked superficial pore; an accessory dorsal branch of lateral line pores. Second dorsal spine more or less serrate. Pectorals inserted below first dorsal; ventrals somewhat anterior to end of opercle,

their outer ray but slightly produced. A naked area surrounding anus and extending to anal fin.

Distribution: Japan, indo-australian Archipelago, North of Kermadec Islands and in Atlantic: known from Gulf of Gascogne, near coast of Soudan and Açores. In depths from 951 to 2995 M.

1. **Cetonurus robustus** Gilb. & Hubbs. [Fig. 19, p. 84].

Cetonurus robustus Gilbert & Hubbs, Proc. U. S. Nat. Mus. LI, 1916, p. 207 and U. S. Nat. Mus. vol. I, 1920, Bull. 100, p. 564.

B. 7; D.[1] II. 9; P. 17; V. 10.

Dorsal contour rising in an even curve to origin of first D., the base of which is oblique. Depth of body over base of ventrals 1.2 in head. Sides of head vertical, without projecting ridges. Snout broadly triangular in front of lateral angles, thrice in head; its tip on a horizontal passing through upper margin of orbit. Orbit nearly round, 4 in head, 1.6 in post-orbital length; interorbital space 2.5 in head; least suborbital width 1.25 in orbit, its ridge bluntly angulated transversely. Mouth oblique, the maxillary extending to below middle of eye, 3.75 in head. Teeth small, confined to anterior half of jaws; intermaxillary band narrow, the outer series scarcely enlarged; mandibulary band very narrow. Barbel minute. Scales small, 14 in a series from origin of second D. to lateral line, 38 from origin of anal to lateral line. Those on the body bear long, curved and suberect spinules arranged in quincunx order, 5 to 12 on each scale on trunk, about 5 on those on head, similar to those on body. Terminal tubercle of snout comparatively weak, rounded, armed with conic spinules; lateral tubercles indistinct. A series of enlarged scales along each side of base of second dorsal, armed with very strong spinules. Median line of gular membrane scaled, branchiostegal membrane naked. First dorsal spine small but sharp, without a longitudinal groove, the anterior edge rounded; second spine rather strong at base, filamentous at tip, about half length of head, its anterior edge trenchant and armed with 21 small, procumbent serrations; base of first dorsal 1.9 in interdorsal space, 1.3 in orbit; second dorsal low, the longest rays 3 in orbit. Origin of anal scarcely behind end of first dorsal. Pectorals 2.6 in head, inserted below first dorsal. Outer ventral ray scarcely filamentous, just reaching anus, 1.33 in orbit; ventrals inserted

anterior to end of opercle. Distance of centre of anus to origin of anal one-third its distance from base of outer ventral ray. A naked area, two-fifths as long as orbit, surrounding anus, and extending to anal. Colour light brown, shading into blackish on belly, head grayish; opercles, lips and mandibles dusky; gular and branchiostegal membranes black. Length more than 285 mm. [After GILBERT & HUBBS, not seen by us].

Habitat: Gulf of Tomini 1399 M.; Gulf of Boni 1280 and 1472 M.; Patientie Strait 1479 and 1545 M. — Sea round Japan in depths of 1097 and 1187 M.

Order ALLOTRIOGNATHI Regan.

Physoclistic. Body strongly compressed, elongate or ribbon-shaped. Scales reduced or absent. Head without spines or serrations, usually with a large occipital crest. Five to six branchiostegals; 4 pectinate gills; well developed pseudobranchiae. Teeth usually feeble or absent, by exception on vomer, none on palatines. Mouth protractile; the maxillaries protractile, being not attached to the palatines and sliding forwards and backwards on each side of a median keel on the vomer and ethmoid. Supramaxillary, subocular shelf, opisthotic are wanting. Supraoccipital well developed, separating the parietals; an orbitosphenoid in contact with the mesethmoid. Pectoral arch attached to the cranium, pectoral fins more or less vertical, their base horizontal or subhorizontal. Ventral fins, if present, below or somewhat behind pectorals; their arch more or less closely connected with the coracoids. Vertical fins, without true spines except sometimes the first one or two rays of the dorsal.

Marine, pelagic or deep sea fishes, mostly of large size.

Note. The Order *Allotriognathi* of REGAN is composed of the *Lamprididae*, *Veliferidae*, *Lophotidae* and the *Taeniosomi* of GILL. The genus *Stylophorus*, formerly referred to the *Taeniosomi*, is made by STARKS the representative of the new suborder *Atelaxia*, recently corroborated by REGAN, though distantly related to the *Taeniosomi*. Of the *Allotriognathi* only the suborder of the *Taeniosomi* is known from the indo-australian region. But the possibility exists, that representatives of the *Lamprididae (Lampris)* and of the *Veliferidae (Velifer)* may be found.

Suborder **Taeniosomi** Gill.

Elongate, strongly compressed. Mouth terminal, protractile, its cleft vertical. Teeth in jaws and on vomer present or absent.

Skin naked; the lateral line may be armed by bony plates. Vent in or before middle of length. Fins composed of flexible, non-articulated rays, of which the anterior dorsal may be spine-like. Dorsal fin extending from head nearly to end of tail, its anterior rays may be more or less detached and elevated; anal wanting; caudal in adult modified or absent. Pectorals with a horizontal base; the vertically directed short rays inserted on the scapula and on three pterygials, which articulate with the coracoid. Ventrals below or behind pectorals with 5 to 9 rays or reduced to a single ray of great length; pelvic bones free from coracoid. Six branchiostegals; gillmembranes separate and free from isthmus; four gills, a slit behind the fourth arch; the anterior with delicate rod-like gillrakers. Skeleton with feebly ossified, thin bones; 90 to above 136 vertebrae.

Distribution: That of the two genera, which probably have the value of separate families.

Key to the indo-australian genera of Taeniosomi.

1. Ventrals with five to nine rays . . . . . *Trachypterus* p. 88.
2. Ventrals with a single ray . . . . . *Regalecus* p. 91.

1. Trachypterus Gouan.

(A. Gouan, Historia piscium, 1770, p. 104).

Elongate. Head short; mouth small, its cleft more or less vertical. Few teeth in jaws and on vomer, none on palatines. Skin naked, smooth or prickly; lateral line with bony plates armed with a spine; it gradually descends to the ventral profile and is confluent with that of the other side beneath the end of the tail; there is a spine at the point of junction. Vent about in the middle of the body. Dorsal occupying the length of the back in the young; its anterior rays are more or less detached and elongate, their length may even surpass several times the length of the fish; they are provided with delicate lappet-like appendages. Anal wanting. Caudal in very young situated as usual, later on divided into a smaller rudimentary lower part and a larger upper one, situated above the axis of the body, its prolonged rays obliquely or vertically directed upwards. Pectorals short; ventrals with 5—9 rays, in the young strongly prolonged. About 90 vertebrae.

Distribution: Known from arctic, temperate and tropical seas. In warm seas living in deep water; till now not yet caught in nets but only found floating dead on the surface or cast on shore after gales.

Note. Great and very puzzling changes take place in these fishes during their growth to maturity. A considerable number of species have therefore been described, which are mere successive stages of development. Not only the total form is altered during growth as also the caudal, as indicated above, but more so the rays of the dorsal and ventral fins. EMERY

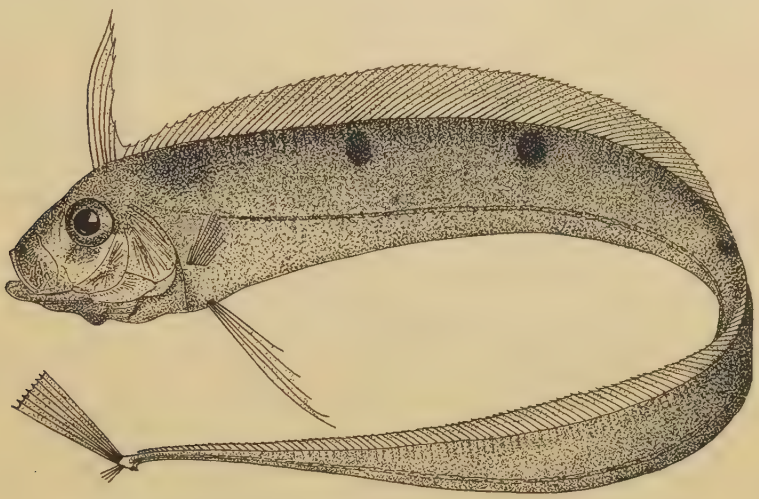

Fig. 20. *Trachypterus iris* C.V. [After CUVIER & VALENCIENNES].

has shown, that they commence to grow rapidly in the very young and continue to lengthen exceedingly till a certain stage is reached, after which a shortening commences. This development is the more puzzling, as, at least the tropical species, are very rare and are only incidentally caught.

1. **Trachypterus semiophorus** Blkr. [Fig. 21, p. 90].

Trachypterus semiophorus Bleeker, Arch. Néerl. Sc. Nat. III, 1868, p. 279.

B. 6; D. 8. 120; P. 11; V. 5; C. 10/5.

Oblong, elongate, belly prominent, tail strongly tapering. Height nearly 4 in length. Head obtuse, obliquely truncate, $5^1/_2$ in length, higher than long, rostronuchal profile, rectilinear, strongly declivous. Dorso-caudal profile on the nape elevated,

behind it sloping in a straight line. Eye $2^2/_3$ to $2^3/_4$ in head. Minute conical teeth in jaws. Skin granular, lateral line rough minute spines. First dorsal situated on the elevated nape, its base smaller than diameter of eye, its rays scarcely shorter than length, provided with distant membranaceous lobules. Second dorsal detached from it, with convex profile, the median rays more than twice the longest. Pectorals acute, more than twice shorter than head. Ventrals reaching to posterior part of tail, the first ray rough by spinules. Superior lobe of caudal vertically directed upwards, longer than head, inferior lobe composed of 5 rudimentary rays. Silvery [1]), with dark transverse bands, four indistinct on head, 12 on back and tail, of

Fig. 21. *Trachypterus semiophorus* Blkr. [After BLEEKER].

which the precaudal ones do not reach the lateral line, those on the tail are complete; 3 or 4 crossbands on belly. Fins yellow, upper caudal lobe with a large black blotch. Length of single specimen known 149 mm. [After BLEEKER, not seen by us].

Habitat: Amboina.

Note: This is a young *Trachypterus*, still in larval stage, as is shown by the dimensions of the trunk and the character of the nuchal dorsal and the ventrals. But the metamorphosis

1) The iridescent epidermis, which misses iridocytes is of remarkable and unique structure, as its cells remember those of the tissue of the chorda (A. Kasckkaroff, Anatom. Anzeiger XLIV. 1913, p. 214).

has already made some progress indicated by the modification of the caudal with the upturned superior lobe of the adult.

This species seems to be quite near the recently described *Trachypterus gavardi* Bounhiol (Bull. Inst. Océanograph. Monaco 1923 N°. 432) from the bay of Alger.

2. **Regalecus** Brünnich.

(Brünnich, Collectio Nova Scriptorum Soc. Scient. Hafnensis 1771, III, p. 418).
Gymnetrus Bloch, Naturgesch. Ausländ. Fische III. 1788, p. 1.

Extremely elongate, ribbon-shaped. Head small, with a high crest and well developed opercular bones. Cleft of mouth small, vertical. A series of minute teeth in the jaws present

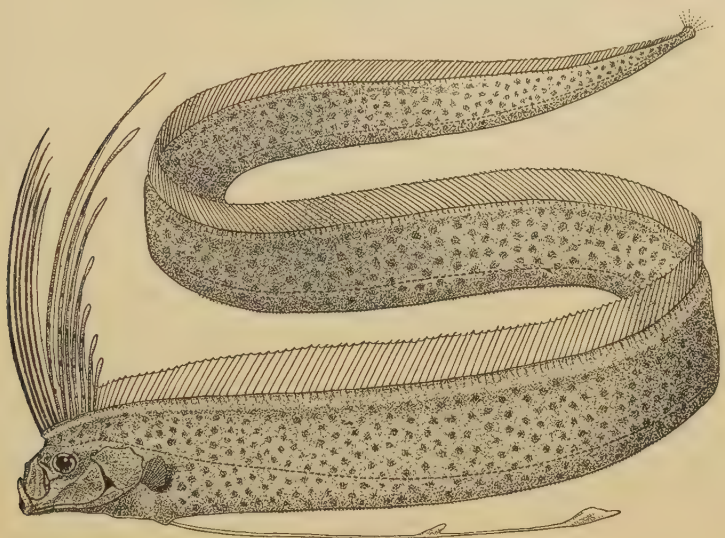

Fig. 22. *Regalecus gradius* C.V. [After Cuvier].

or absent; none on palate. Skin naked, studded with numerous hard but not bony tubercles; lateral line present, running along the lower third or fourth of body, with or without flat elongate scales. Dorsal extending along the length of the body with 160 to 406 rays, the anterior of which, situated on the nape, may be much produced. No anal. Caudal rudimentary or wanting [1]). Pectorals short with 11 to 14 rays. Each ventral

1) According to Lütken it is very possibly present in the young and lost by mutilation.

consisting of a single ray which may reach an extreme length and may be fringed by membrane, terminating in an expansion. Vent before middle of length. The number of vertebrae may increase to above 136. No larval stages known.

Distribution: Deep sea fishes from temperate and tropical seas, probably living in intermediate depth; never caught in a net and only known from more or less mutilated specimens brought to the surface by accident or thrown on shore after gales.

The only instance known to us of the occurrence of *Regalecus* in the seas of the indo-australian Archipelago, we derive from a note, corroborated by a sketch and a photograph Prof. Dr. F. WOOD JONES was so kind to forward to us.

An extract of his journal says: „On October 28th 1906, 30 miles South of the Island of Sumbawa at 9° 16′ S., 117° 8′ 35″ E. depth 1200 fathoms, whilst the ship was hanging on to his cable, at about 10 a.m. a long and very beautiful fish came to the surface at our bows and stood with his nose close to cable, just keeping pace with the current. Baited hooks were thrown to it but it took no notice of them. Attempts were made to hook it or catch it with a running bowline, but without success. Whenever it was touched by a hook or a rope, a crest of a fine red colour was erected from the head. This crest was nearly 3 feet out of water. The fish slowly sank again but appeared later in the morning again and was at least scrambled in board a boat (Fig. 23). In the water the fish was a wonderful sight. The vivid red crest and dorsal fin, and the scarlet streamers of his sides, and the blue of his head and intense shine of silver of his body making him very beautiful in the clear water. His tail end was bitten off just behind the vent; the remaining head and body measured 11 feet 9 inches (3582 mm.), it weighed 140 lbs (ca 63 K.), the greatest depth was 13 inches (330 mm.). It had no scales, a well marked lateral line, tiny 11 rayed pectorals, no teeth whatever".

Dr. WOOD JONES called it provisionally *Regalecus glesne pacificus* and his coloured sketch made on the spot, shows that he was quite right in defining it as *Regalecus*. But the fact that more than half the length is lost and therefore the proportions of the height, of the length of the head, and that of the trunk in the total length, as also the number of dorsal rays is unknown, makes it impossible to make out to which species

it may belong, even if the specific characters of the various described species were fixed. And this is not the case as the few specimens that came under observation, usually were more or less damaged on account of the brittleness of the flesh and the fin-rays and softness of the bones of these rare fishes.

T. J. PARKER [1]), the latest author on this subject, gives a key to 8 more or less recognised species of *Regalecus*, but adds that they must be looked upon as more or less provisional

Fig. 23. See page 92.

and that it must be borne in mind, however, that the analogy of *Trachypterus* lends strong support to LÜTKEN's opinion that the proportions of the head and body, the number of fin rays, and the character of the tail differ greatly at different ages. There are authors inclined to regard the described species as belonging to one single species which than ought to be called *Regalecus glesne* Ascanius.

About the Sumbawa specimen, we can only establish, that

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1) T. JEFFERY PARKER, Trans. New Zealand Institute XVI. (1883) 1884, p. 284.

it had no teeth, eleven-rayed pectorals, the nuchal part of the dorsal fin transformed into a crest of about 3 feet height and the single ray of the ventrals fringed by a red membrane, with distant expansions. As the proportion of the preanal part of the length to the postanal length varies in some of the measured specimens of *Regalecus* between 1.27 and 2.5 and is always conspicuously shorter than the latter, the Sumbawa specimen had at least a length of over 8 M.

Order HETEROSOMATA.

Body strongly compressed, flat. Head asymmetrical, the skull twisted in front, with the two orbits on one side in the adult. The eyed side, which is turned upwards in normal position, is either the left or the right one. Only in *Psettodes* the number of dextral and sinistral individuals is about the same, in all others the species and even the genera are either left- or right-sided, and individual divergencies are rare. The asymmetry is not only confined to the eyes, but also to the mouth, which is generally more or less twisted; otherwise more or less protractile, bordered above by the intermaxillaries only. Teeth present, very small or obsolete, in many cases more developed on the blind side. The paired fins are often asymmetrical too or wanting at one side; the anus and genital porus are also often removed from the median line. The eyed-side is pigmented, the blind side generally without pigment. Dorsal and anal long, many-rayed, without spines (with one exception). Ventrals 6—rayed or less, thoracic or jugular, attached to the cleithra; only in one case their first ray is spinous, in all others the paired fins are soft-rayed; often some of the rays of dorsal, ventrals or pectorals are filamentous. Scales various, rarely absent, usually small. Lateral line usually present, sometimes du- or triplicated or wanting. Gills four. Pseudobranchiae well developed. Airbladder absent in the adult. The larvae are transparent and symmetrical and swim in the ordinary position. During development one of the eyes moves by degrees to the other side, the fish sinks to the bottom and acquires its definite form and its habit to rest on the blind side.

Carnivorous fishes, living on the sandy and muddy bottom of all coasts and seas; many ascend rivers. Many of them are important food-fishes.

Key to the families.

I. Dorsal fin not extending on the head, anterior dorsal rays more or less spinous. Ventrals nearly symmetrical with a spine and 5 soft rays. . . . . *Psettodidae* p. 96.

II. Dorsal beginning on head. No dorsal or ventral spines.
A. Lower jaw prominent. Mouth terminal. Praeoperculum with a free margin.
1. Eyes on the left side . . . . . *Bothidae* p. 98.
2. Eyes on the right side . . . . . *Pleuronectidae* p. 133.
B. Lower jaw not prominent. Mouth small. Dentition much more developed on blind side than on coloured side. . . . . *Soleidae* p. 146.

1. Fam. Psettodidae.

Dorsal fin not extending forward on the head; anterior dorsal rays more or less spinous; ventrals nearly symmetrical in form and position, consisting of a spine and 5 soft rays. Nasal openings on blind side scarcely higher than those on other side; olfactory laminae arranged transversely to or radi-

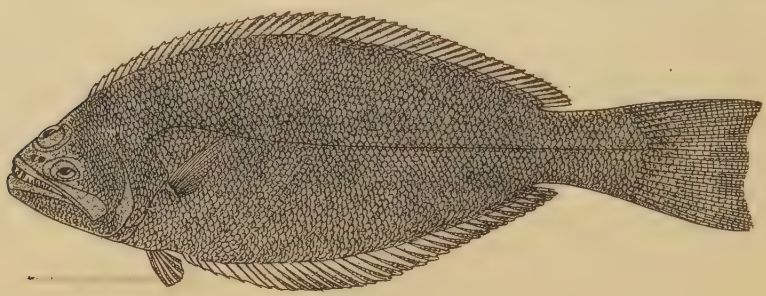

Fig. 24. *Psettodes erumei* (Bl. Schn.) $\times {}^{3}/_{10}$.

ating from a central rachis. Maxillary with a well developed supramaxillary bone, palatines toothed. Urohyal normal, the lower edge scarcely curved. Two post-cleithra on each side. Vertebrae 24 (10 + 14). Praecaudal parapophyses downwardly directed and united to form closed haemal arches; pectoral radials well developed.

1. Psettodes Bennett.

(Bennett, Proc. Comm. Zool. Soc. 1831, p. 147).

For characters of the single genus see above.
Sinistral and dextral specimens equally numerous.

1. Psettodes erumei (Bl. Schn.). [Fig. 24, p. 96].

Pleuronectes erumei Bloch, Schneider, Systema Ichthyol. 1801, p. 150.
Hippoglossus erumei Rüppell, Atl. Reise Nördl. Afrika, Fische d. Rothen Meeres, 1828, p. 121. — Neue Wirbelthiere Abyssinien Fische, 1835—1840, p. 84.
Hippoglossus dentex Richardson, Zoology Voy. Sulphur, Fische, 1843—1845, p. 102.
Hippoglossus orthorhynchus Richardson, Rep. 15th meeting Brit. Ass. Fish. China, Japan, 1846, p. 278.
Hippoglossus erumei Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1198, p. 1200.
Hippoglossus erumei Bleeker, Verh. Bat. Gen. XXIV. 1852, p. 13.
Psettodes erumei Bleeker, Versl. Akad. Amsterdam XIII. 1862, p. 424.
Psettodes erumei Günther, Cat. Brit. Mus. IV. 1862, p. 402.
Psettodes erumei Kner, Novara Exp. Fische 1865—1867, p. 282.
Psettodes erumei Bleeker, Atl. Ichth. VI. 1866—1872, p. 4.
Psettodes erumei Klunzinger, Verh. Zool. Bot. Ges. Wien, Bd. XXI. 1871, p. 570.
Psettodes erumei Day, Fishes of India 4°. 1878—1888, p. 422.
Psettodes erumei Jordan & Seale, Bull. Bureau Fish. XXVI. 1906, p. 45.
Psettodes erumei Evermann & Seale, l.c. p. 106.
Psettodes erumei Bean & Weed, Proc. U.S. Nat. Mus. 42, 1912, p. 610.
Psettodes erumei Barnard, Ann. South Afric. Museum XXI. 1925, p. 383.

D. 49—54; A. 36—44; P. 14—15; V. 1.5; L.l. 72—77; L. tr. $\frac{21—25}{1}$.
$\overline{33—41}$

Height 2.1—2.7, 2.5—3.3 in length with caudal. Head 2.9—3.5, 3.5—4 in length with caudal. Upper eye just visible from the blind sight, lower eye generally slightly smaller, placed somewhat more posteriorly than the upper eye. Eye 5.2—8.4, equal to one half of interorbital space, 3—4 in postorbital part of head. Maxillaries large, 1.1—1.4 in head, reaching much farther than eyes. Posterior and anterior nostrils close together, those of the upperside in front of interorbital space. Teeth in the jaws long distant canines, sharply pointed, some of them curved, hastated or sagittated, in two or three rows, the hindermost smaller and more crowded. Those of the inner row are flexible, the outer ones fixed. A patch of small teeth on vomer and in a single row on palatines. Glossohyal, basihyals and gillarches with curved teeth, replacing the gillrakers. Origin of dorsal in or somewhat behind vertical through hindborder of lower eye. End of dorsal slightly before that of anal, which begins below about the 19th dorsal ray. Pectorals somewhat shorter than or equal to postorbital part of head. Ventral of blind side inserted somewhat behind the other one, their length about $^2/_3$ of that of pectorals. Caudal scalloped, the outer and middle rays being longer than the others. Head scaly to

between the eyes, where the scales get rudimentary. On this side the maxillary is scaly too. Scales with fine granulated striae, diverging to the hindborder, which is undulated. Those on the abdomen almost smooth. Colour in alcohol uniform brown on coloured side, fins darker. Four transverse dark bands on the body are sometimes present in young specimens and may be preserved in older ones. Length 400 mm.

Nom. indig: Mata-sablah, Kalankan (Malay Batavia), Betteh (Cheribon), Grobiat (Javanese Pasuruan).

Habitat: Singapore; Sumatra (Trussan, Padang, Tiku, Priaman); Nias; Bintang; Rio; Banka; Java (Batavia, Japara, Bantam, Anjer, Cheribon, Pekalongan, Semarang, Tuban!, Surabaya, Pasuruan, Besuki!); Java-sea 82 M.!; Madura!; Celebes (Makassar!, North Celebes); Flores 30 M.!; Ambon. — From Madagascar, Delagoa Bay, Zanzibar, Red Sea, Persian Gulf, coasts of India, bay of Bengal, Tonkin, Philippines, China, Formosa and Japan.

Note. *P. belcheri* Benn. from the West coast of Africa, which has been united with this species, differs in having smaller scales.

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2. Fam. Bothidae.

Eyes normally on the left side. Dorsal fin extending on the head, no spiny finrays; ventrals either short-based and symmetrical, or the base of that of left side longer than that of the right. Mouth large or moderate, terminal, the lower jaw somewhat prominent and often with a symphysial knob on the chin. Teeth in jaws more or less equally developed on both sides, caninoid teeth often present. Palate edentulous. Olfactory organ with the laminae arranged transversely to, or radiating from, a central rhachis. Lateral line with a curve anteriorly. Pectoral radials present.

Key to the indo-australian genera of Bothidae.

I. Ventrals equal, short based (*Paralichthinae*). Teeth in jaws in a single series. Mouth wide or moderate . . . *Pseudorhombus* p. 99.

II. Base of left ventral much longer than that of right (*Bothinae* [1]).

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1) *Bothinae* Regan 1920 = *Platophrynae* Regan 1910. *Bothinae* Regan 1910 = *Psettinae* Regan 1920.

A. Teeth in bands. Jaws and dentition unequally developed on the two sides. Mouth small. Origin of dorsal above frontmargin of eye. Scales small, thin, deciduous. . . . . *Laeops* p. 115.

B. Teeth in one or two rows. Jaws and dentition evenly developed on both sides. . . . . *Bothus* p. 116.

1. Pseudorhombus Bleeker.

(Bleeker, Versl. Akad. Amsterdam, XIII. 1862, p. 426).

Eyes normally on left side. Mouth moderate or large, reaching below eye. Teeth in jaws rather strong, sometimes caninoid, in a single series. No teeth on palate. Eyes close together, separated by a bony ridge. Scales small or of moderate size, ctenoid or partly cycloid on left side, generally cycloid on

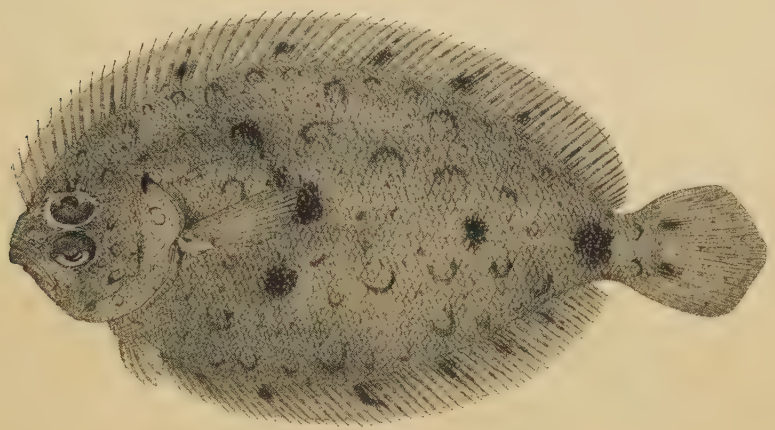

Fig. 25. *Pseuaorhombus affinis* M. Web. $^2/_3$ n. s.

right side. Fins scaly. Dorsal beginning on snout, none of its rays enlarged. Lateral line present on both sides with a strong curve anteriorly and with an accessory branch running upwards to base of dorsal. Ventrals short-based, symmetrical. Gillrakers slender or very short knobs, dentated. Gillmembranes united, free from isthmus.

Distribution: Indic and Westpacific.

Key to the indo-australian species of Pseudorhombus.

I. Scales ctenoid on blind side. Maxillary reaches hindborder of eye. . . . . *P. oligodon* p. 101.

II. Scales cycloid on blind side.

A. Maxillary reaching quite or almost hind-border of eye in adult specimens.

1. Gillrakers palmate, as long as broad. Height 2—2.3 . . . . . *P. dupliciocellatus* p. 102.

2. Gillrakers lanceolate, longer than broad. Height 1.8—2.1.

a. Height of caudal peduncle less than snout and eye. Praeanal spine strong. *P. quinquocellatus* p. 104.

b. Height of caudal peduncle equal to snout and eye. Praeanal spine short, below skin.

α. Dorsal profile arched. Axis through bony ridge separating eyes perpendicular, reaching posterior half of dorsal . . . . . *P. arsius* p. 105.

β. Dorsal profile sloping. Axis through bony ridge separating eyes horizontal, reaching caudal. . . . . *P. polyspilus* p. 106.

B. Maxillary reaching to middle of eye.

1. Height 1.5. Teeth minute. Anterior rays of dorsal longer than the following . . . *P. triocellatus* p. 108.

2. Height 1.8—2.5. Anterior rays of dorsal shorter than the following.

a. A line connecting origin of dorsal and posterior nostril on blind side, does not reach maxillary.

α. Scales on posterior half of coloured side cycloid. Forward prolongation of lateral line reaches upper profile at the 10th or 11th dorsal ray. . . *P. javanicus* p. 109.

β. Scales on entire coloured side ctenoid. Forward prolongation of lateral line reaches upper profile at 8th to 10th dorsal ray . . . . . *P. affinis* p. 110.

b. A line connecting origin of dorsal and posterior nostril reaches anterior half or middle of maxillary.

α. Pointed canine teeth absent. No praeanal spine.

α'. Forward prolongation of lateral line reaches upper profile between

7th and 8th dorsal ray. Teeth conical. . . . . *P. neglectus* p. 111.

β'. Forward prolongation of lateral line reaches upper profile between 9th and 10th dorsal ray. Teeth pointed . . . . . *P. argus* p. 113.

β. Some canine teeth in upper jaw. Praeanal spine present. . . . . *P. penthophthalmus* p. 114.

Doubtful species . . . . . *P. guttulatus* Macl. p. 115.

1. Pseudorhombus oligodon (Blkr.).

Rhombus oligodon Bleeker, Nat. Tijdschr. Ned. Indië VI. 1854, p. 419; Act. Soc. Sc. Indo-Neerl. V. 1858—1859, 5de bijdr. Japan, Tab. III, fig. 2.

Pseudorhombus malayanus Bleeker, Ned. Tijdschr. Dierk. III. 1866, p. 43; Atl. ichth. VI. 1866—1872, p. 7 [1]).

Pseudorhombus oligodon Jordan & Evermann, Proc. U. S. Nat. Mus. Wash. XXV. 1902, p. 365.

Pseudorhombus cinnamomeus Jordan & Starks, Proc. U.S. Nat. Mus. Wash. XXXI. 1906, p. 174 (nec SCHLEGEL).

Pseudorhombus malayanus Jordan & Richardson, Bull. Bureau Fish. Washington XXVII. 1908, p. 281.

Pseudorhombus oligodon Snyder, Proc. U.S. Nat. Mus. Wash. XLII, 1912, p. 438.

D. 73—76; A. 54—60; P. sin. 2.8.2; P. dextr. 9—11; V. sin. et detr. 2.4; L.l. 75—84.

Upper profile evenly convex. Height 1.8—2, 2—2.4 in length with caudal. Head 2.9—3.5, 3.4—4.1 in length with caudal. Eyes nearly equal, 4.1—6.1 in head, 2.5—3 in postorbital part of head, separated by a narrow ridge, above each other or the upper one somewhat in front of the lower. Nostrils on coloured side in a horizontal line, the hinder one a large hole, the anterior one very small and provided with a flap; at the blind side the anterior nostril is placed somewhat higher and bears a tentacle in stead of a flap. Maxillary scaly on coloured side, reaching to below hindborder of eye, at least in full-grown specimens, 2—2.2 in head. Mouth strongly oblique. Teeth in both jaws caninoid and wide apart anteriorly, small and crowded posteriorly. The canines are often hastate, 3 to 5 in each side of upper jaw and 7—10 in each side of lower

1) On the plate in the Atlas ichthyol. this species is by a misprint, called *P. maldydnus*, what misled KNER (Novara Exp. Fische, 1865—1867, p. 284) to mention the species under this name.

jaw. Tongue smooth. Origin of dorsal beginning on blind side, above posterior nostril, a line through both reaches the maxillary in its anterior half. All dorsal and anal rays simple. The anterior rays the shortest, the sub-posterior ones the longest. Origin of anal before vertical through hindborder of operculum. No praeanal spine. Dorsal and anal ending close to caudal, which is bluntly pointed. Scales ctenoid on both sides, covering the head with exception of the snout. The forward prolongation of the lateral line reaches the upper profile at the 8th or 9th dorsal ray. Pectoral of coloured side longer, that of blind side shorter than postorbital part of head. Ventrals equal, somewhat shorter than snout and eye. Nine to eleven compressed lanceolate gillrakers on lower branch of first arch, dentated behind and not quite as long as half diameter of eye. Colour of alcohol specimens brown on coloured side, sometimes with indications of a dark blotch in lateral line behind curvature and another between it and caudal. Vertical fins more or less variegated with dark brown. Length 220 mm. [Type of *P. oligodon* and typical specimens of *P. malayanus* in the Leiden Museum examined].

Habitat: Singapore, Sumatra (Telokbetong, Benkulen); Banka straits!; South Chinese Sea!; Java-sea (many localities)!; Java (Batavia, Indramaju!, Tuban!, Besuki!, Probolingo!, Pasuruan!); Madura straits 52 M.!; Madura!; Borneo (Pamangkat); Macassar straits!; Saleyer 18—45 M.!; Celebes (Makassar); Amboina. — From Bay of Bengal to Philippines, Formosa, Riu-Kiu Islands and Japan.

2. **Pseudorhombus dupliciocellatus** Regan.

Pseudorhombus dupliciocellatus Tate Regan, Ann. Mag. Nat. Hist. (7) XV. 1905, p. 25.

Pseudorhombus dupliciocellatus Jordan & Starks, Proc. U. S. Nat. Mus. XXXI. 1906, p. 177.

Platophrys palad Evermann & Seale, Bull. Bur. Fish. XXVI. 1906, p. 105.

Pseudorhombus cartwrighti Ogilby, Mem. Queensl. Mus. vol. I. 1912, p. 47.

D. 72—75; A. 53—61; P. sin. 2.8.2; P. dextr. 12; V. 3.2.1; L. l. 75—84.

Elongate, dorsal profile ascending in an arched line above eye. Height 2—2.3, 2.4—2.7 in length with caudal. Head 3.3—3.4, 4—4.1 in length with caudal. Eyes 3.9—5.7, nearly equal, above each other, separated by a very narrow elevated

bony ridge, longer than snout, 2—2.5 in postorbital part of head. Eyelid with a tentacle in some specimens. Maxillary scaly on coloured side, reaching beyond middle of eye or not so far, 2.1—2.5 in head. Pointed, rather weak, distant canines in both jaws, the anterior ones of upper jaw somewhat larger. Origin of dorsal beginning on blind side, above or somewhat behind posterior nostril. A line connecting both reaches anterior half of maxillary. Dorsal and anal rays simple, scaly. The subposterior rays the longest. Origin of anal above or somewhat before vertical through hindborder of operculum. Praeanal spine generally inconspicuous, sometimes piercing the skin. Caudal bluntly pointed. Scales ctenoid on coloured sides, in old specimens the scales have only a thickened rough patch at hindborder, cycloid on blind side, covering the head with exception of the snout. Top of curve of lateral line separated by about 17—18 scales from dorsal profile, its forward prolongation reaches dorsal profile at 7th dorsal ray. Left pectoral somewhat more or less than postorbital part of head, right one equal to or shorter than snout and eye. Ventrals equal to distance between anterior nostril and hindborder of eye. Gillrakers palmate, as long as broad, dentated round their free margin, 9—10 on lower branch of first arch. Colour of alcohol specimens yellowish white to reddish brown, with three large ocelli, one below lateral line just at end of its curve, a second one more posteriorly between lateral line and anal and a third one above the second, between lateral line and second one. Each ocellus consists of two dark brown round blotches, each surrounded by chalk-white dots, the whole surrounded at some distance by a brown ring, which sometimes too is freckled with white. Indistinct brown rings scattered on body, dorsal, anal and caudal. Caudal and left pectoral variegated with dark brown. Length 255 mm.

Habitat: Seventeen specimens of different localities in eastern part of Java Sea!, depth to 100 M., collected by Exploration steamer "Gier". — Philippines, Japan, Queensland.

Note. This species is closely allied to *Pseudorhombus spinosus* Mc Culloch from western Australia, which has the same colour-pattern and peculiar form of gillrakers. It differs by having ctenoid scales on the coloured side. Besides the maxillary is said to be scaleless in *P. spinosus*.

3. **Pseudorhombus quinquocellatus** n. sp.

D. 68—70; A. 52—55; P. sin. 2.9.1; P. dextr. 12; V. 2.4; L.l. 79.

Dorsal and ventral profile evenly convex. Height 2—2.1, 2.4—2.5 in length with caudal. Head 3.2—3.5, 3.8—3.9 in length with caudal. Eyes nearly equal, the upper one somewhat behind the lower, 4—4.6 in head, about equal to snout, twice or more than twice in postorbital part of head, separated by a narrow bony ridge, which, when continued backwards, reaches the caudal. Maxillary scaly on coloured side, reaching nearly to below hindborder of eye, 2—2.1 in head. Mouth strongly oblique. Long, pointed, sometimes hastate canines in jaws, diminishing in size posteriorly, where they are somewhat more crowded. Origin of dorsal beginning on blind side, above posterior nostril, a line through both reaches maxillary at its anterior half. All dorsal and anal rays, excepting the hindermost dorsal ones, simple, scaly. The subposterior rays the longest. Origin of anal somewhat before or behind vertical through hindborder of operculum. A strong praeanal spine, pierced through the skin. Scales ctenoid on coloured side, cycloid on blind side, covering the head with exception of the snout. The forward prolongation of the lateral line reaches the upper profile at the 8th dorsal ray. Fourteen to fifteen scales between top of curve of lateral line and dorsal. Left pectoral longer than postorbital part of head, right pectoral equal to eye and snout. Ventrals somewhat shorter. Nine to ten lanceolate compressed gillrakers on lower branch of first arch, dentated behind, less than half eye. Height of caudal peduncle less than snout and eye. Colour of alcohol specimens reddish brown. Five black blotches on body, disposed thus ::· , the hindermost on lateral line, the others above and below lateral line, the upper anterior one just touches top of curve of lateral line. The blotches are surrounded at some distance by a brown ring. Indistinct rings scattered here and there on body. Fins with dark margins. Length of three specimens 180—200 mm.

Habitat: Strait Madura 80—100 M.!; near Kangeang Islands!.

Note. This species differs from *P. penthophthalmus* to which it is related by the longer maxillary and specially by having

only 9—10 gillrakers. The first difference mentioned is of no great importance, as we have only been able to examine adult specimens of this species, whereas the type of *P. penthophthalmus* is young (see p. 114).

4. Pseudorhombus arsius (H. B.).

Pleuronectes arsius Hamilton Buchanan, Fishes Ganges, 1822, p. 128.
Platessa russellii Gray, Illustr. Indian Zoology 1830—1835, pl. 94, fig. 2.
Rhombus lentiginosus Richardson, Ann. Mag. Nat. Hist. XI. 1843, p. 495.
Platessa russelli Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1196.
Pseudorhombus russellii Günther, Cat. Brit. Mus. IV. 1862, p. 424 (sine syn.).
Pseudorhombus lentiginosus Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 184.
? *Pseudorhombus russellii* Kner, Novara Exp. Fische I. 1865—1867, p. 283.
Pseudorhombus Russelli Bleeker, Atl. ichth. VI. 1866—1872, p. 6.
Pseudorhombus arsius Day, Fishes of India 4°, 1878—1888, p. 423.
Pseudorhombus Russellii Klunzinger, Sitzber. Akad. Wien, 1880, p. 406.
Pseudorhombus Russellii Macleay, Descr. Cat. Austr. Fish. II. 1881, p. 124 [1]).
Pseudorhombus russelii Sauvage, Poissons de Madagascar 1891, p. 473.
Paralichthys arsius Rutter, Proc. Acad. Nat. Sc. Philadelphia 1897, p. 87.
Platophrys russellii Evermann & Seale, Bull. Bureau Fisheries XXVI. (1906) 1907, p. 105.
Pseudorhombus arsius Jenkins, Mem. Indian Mus. III. N°. 1, 1910, p. 24.
? *Pseudorhombus arsius* Snyder, Proc. U. S. Nat. Mus. Wash. XLII, 1912, p. 439.
Pseudorhombus arsius Mc Culloch, Checklist N. S. Wales, Prt. II. 1919, p. 35.
Pseudorhombus ruselli Tate Regan, Ann. Durban Mus. vol. II. Prt. 5, 1920, p. 208.
Pseudorhombus arsius Hora, Mem. Indian Mus. V. 1923, p. 758.
Pseudorhombus russelli Barnard, Ann. South Afric. Mus. XXI. 1925, p. 388.

D. 71—76; A. 54—56; P. 2.8.2 or 2.9.2; V. 2.4 or 2.3.1; L. l. 75—80.

Dorsal profile arched, strongly ascending above eyes, more convex than ventral profile. Height 1.8—2.1, 2.1—2.5 in length with caudal. Head 3—4, 3.7—4.7 in length with caudal. Eyes nearly equal, 4—4.2 in head, equal to snout, somewhat more than twice to more than thrice in postorbital part of head. Upper eye somewhat in advance of lower one, separated by a narrow bony ridge, the axis of which, when continued backwards, reaches the posterior part of the dorsal. Anterior nostrils, which are provided with a flap, placed somewhat higher than posterior ones. Maxillary with some deciduous scales on coloured side, reaching almost to hindborder of eye, 2—2.2 in head. Anterior teeth in upper jaw long, slender canines, diminishing in size posteriorly, were the teeth are more crowded. Eight

1) *Teratorhombus excisiceps* Macleay l. c. p. 126, is a malformation of *Pseudorhombus arsius* (H. B.).

to ten smaller canines in lower jaw, generally separated, sometimes more crowded. Tongue smooth. Origin of dorsal beginning on blind side, somewhat in advance of posterior nostril, a line through both reaches maxillary in its anterior half. All dorsal and anal rays simple, scaled. The anterior rays the shortest, the subposterior ones longest. Origin of anal before or below, in young specimens behind vertical through hindborder of operculum. A short praeanal spine below skin. Dorsal and anal ending close to caudal, which is bluntly pointed. Scales ctenoid on coloured side, cycloid on blind side, covering the head with exception of the snout. The forward prolongation of the lateral line reaches the dorsal profile at the 9th or 10th dorsal ray. Left pectoral equal to or longer, right pectoral shorter than postorbital part of head. Ventrals of equal length, equal to snout and eye. Nine compressed bluntly lanceolated gillrakers, dentated behind and less than half eye. Height of caudal peduncle equal to snout and eye. Colour of alcohol specimens brownish on coloured side, with indications of two dark blotches on lateral line, exceptionally bordered with white. Sometimes faint indications of other blotches, scattered on body. Fins with brown markings. Length 240 mm.

Nom. indig. Tampar, mata-sablah (Malay).

Habitat: Singapore; Sumatra! (Kota Radja!, Siboga, Benkulen, Telokbetong); Banka; Bintang; Java! (Batavia, Japara, Bantam, Cheribon!, Pasuruan); Borneo! (Pamangkat, Pontianak, Kota Baru!, Sampit); Celebes (Makassar); Ambon!; Ceram; Aru-islands!; New Guinea!. — Madagascar, east-coast of Africa, coast of India, Andamans, Siam, Cochin China, Philippines, China, Japan and eastwards to Australia.

In sea and estuaries.

5. **Pseudorhombus polyspilus** (Blkr.). [Fig. 26, p. 107].

Rhombus polyspilos Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 503.
Pseudorhombus polyspilos Bleeker, Versl. Akad. Amsterdam XIII. 1862, p. 426.
Pseudorhombus polyspilus Bleeker, Atl. ichth. VI. 1866—1872, p. 7.
Pseudorhombus polyspilus Klunzinger, Sitzber. Akad. Wien 1880, p. 406.
Pseudorhombus multimaculatus A. B. Meyer, Anal. Soc. Esp. Hist. Nat. XIV. 1885, p. 40 (nec Gthr. according to specimens examined in British Museum).
Paralichthys polyspilus Fowler, Journ. Acad. Nat. Sci. Philadelphia (2) XII. Prt. 4, 1904, p. 555.
Pseudorhombus polyspilus Jordan & Seale, Bull. Bur. Fish. Wash. XXVI. (1906) 1907, p. 45.

Pseudorhombus polyspilus Jordan & Richardson, ibid. XXVII. 1908, p. 281.
Pseudorhombus polyspilus M. Weber, Siboga-Exp. Fische 1913, p. 424.
Pseudorhombus polyspilus Ogilby, Memoirs Queensland Mus. I. 1912, p. 45.

D. 70—76; A. 53—57; P. sin. 2.7.2 or 1.8.2 or 1.9.2; P. dextr. 10—12; V. 2.3.1; L. l. 70—82.

Upper profile gently raising from snout, without abrupt elevation above eyes. Ventral and dorsal profile about evenly convex. Height 1.8—2.1, 2.2—2.6 in length with caudal. Head 3.2—3.6, 4.1—4.4 in length with caudal. Eyes nearly equal, 4—5.5 in head, equal to snout, 2.5 to more than three in postorbital part of head, separated by a rather narrow bony ridge, the axis of which, when continued backwards, reaches the caudal. Eyes situated above each other. Anterior nostril

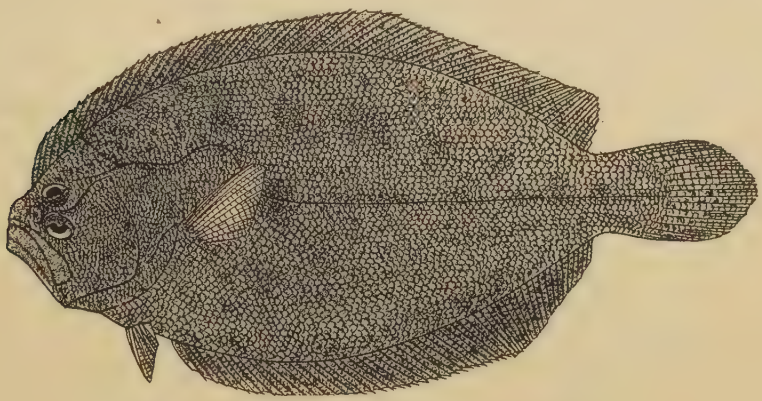

Fig. 26. *Pseudorhombus polyspilus* (Blkr.) $^1/_2$ n. s.

on both sides somewhat higher than posterior one and provided with a flap. Maxillary scaly on coloured side, reaching nearly to hindborder of eye, 2.3—2.4 in head. Mouth strongly oblique. Anterior teeth in upper jaw, long pointed canines, gradually decreasing in size posteriorly, where they are more crowded. In the lower jaw about 8 distant canines. Tongue smooth. Origin of dorsal beginning on blind side, above posterior nostril; a line through both reaches the maxillary in its anterior half. All dorsal and anal rays simple, scaled. The anterior rays the shortest, the subposterior ones longest. Origin of anal in or somewhat behind vertical through hindborder of operculum. A short praeanal spine below skin. Dorsal and anal ending close to caudal, which is bluntly pointed. Scales ctenoid on coloured side, cycloid on blind side, covering the head with

exception of the snout. The forward prolongation of the lateral line reaches the upper profile at the 9th or 10th dorsal ray. Left pectoral equal to or longer than postorbital part of head, right pectoral conspicuously shorter. Ventrals of equal length, shorter than or equal to snout and eye. Nine compressed bluntly lanceolate gillrakers on lower branch of first arch, dentated behind and about one third of eye. Height of caudal peduncle equal to snout and eye. Colour of alcohol specimens brown on coloured side, with two or three brown blotches on lateral line, sometimes surrounded by white, and with indications of other blotches irregularly scattered on the body. Fins more or less spotted with brown. Length 270 mm.

Nom. indig. Mata sablah (Batavia).

Habitat: Singapore; Simalur!; Sumatra! (Padang, Telokbetong, Benkulen, Tiku); Java (Batavia); Strait Madura!; Celebes (Makassar!, Badjoa); Saleyer 18—45 M.!; Buton!; Batjan; Ambon!; Ceram; Waigeu; Aru-islands!. — Queensland, Philippines, China.

Note. Even after all what has been written on the relation of this species and *P. arsius*, and after the examination of a large material, it is difficult to come to a conclusion on the validity of the two species. The chief differences between the two species is the position of the eyes. In *P. polyspilus* the ridge separating the eyes is nearly horizontal, the eyes being above each other, in *P. arsius* this ridge is perpendicular and the upper eye is somewhat in advance of the lower. The upper profile is also much more arched in typical *P. arsius*, but there is a certain variability in this character and some specimens of *P. polyspilus* are much more elevated than the rest. As a rule the teeth in the lower jaw of lastnamed species are shorter and more crowded than in *P. arsius*.

6. **Pseudorhombus triocellatus** Bl. Schn.

Pleuronectes trioceliatus Bloch, Schneider, Syst. Ichth. 1801, p. 145.
Rhombus triocellatus Valenciennes, in Cuvier: Règne animal, Nouv. (3e) edit. 1836—1846, IV. Poissons, in note 1, p. 304.
Rhombus triocellatus Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 528.
Pseudorhombus triocellatus Günther, Cat. Brit. Mus. IV. 1862, p. 428.
Pseudorhombus triocellatus Kner, Novara Exp. Fische, 1865—1867, p. 284.
Pseudorhombus triocellatus Bleeker, Atl. ichth. VI. 1866—1872, p. 9.
Pseudorhombus triocellatus Day, Fishes of India 4°, 1878—1888, p. 424.

Paralichthys triocellatus Fowler, Journ. Acad. Nat. Sc. Philadelphia (2) XII, 1904, p. 555.

D. 67—69; A. 47—51; P. sin. 2.8.2; P. dextr. 11; L.l. 65—70.

Very elevate, dorsal profile much arched. Height 1.5, twice in length with caudal. Head 3.1, 4.1 in length with caudal. Eyes 4, about equal, above each other, separated by a low bony ridge, somewhat more than snout, more than twice in postorbital part of head. Maxillary scaly on coloured side, 1.9 in head, reaching to below middle of eye. Mouth very oblique, a single row of minute teeth in both jaws. Origin of dorsal beginning on blind side above anterior nostril. A line through origin of dorsal and posterior nostril does not reach maxillary. Dorsal and anal rays all simple. Anterior dorsal rays the longest; subposterior anal rays the longest. Scales ctenoid on coloured side and on anterior half of blind side, cycloid on posterior half of blind side. Top of curve of lateral line separated by 13—14 scales from dorsal. Anterior prolongation of lateral line reaching dorsal profile at 12th scale (on blind side). Left pectoral somewhat longer than head without snout, right pectoral shorter than eye and snout, ventrals scarcely shorter. Fiveteen slender gillrakers, longer than half eye diameter, on lower branch of first branchial arch. Colour brownred, with three dark ocelli, one on lateral line below posterior part of dorsal, two on each side of lateral line, in the vertical through middle of dorsal. Body and fins with scattered dark markings. Length 200 mm.

Habitat: Sumatra (Priaman, Padang); Moluccos! [Leiden Museum]. — Ceylon, British India, Tahiti?, Hongkong?, Japan?.

7. Pseudorhombus javanicus (Blkr.).

Rhombus javanicus Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 502.
Pseudorhombus javanicus Günther, Cat. Brit. Mus. IV. 1862, p. 427.
Pseudorhombus javanicus Bleeker, Atl. ichth. VI. 1866—1872, p. 8.
? *Pseudorhombus javanicus* Day, Fishes of India 4°, 1878—1888, p. 424.
Platophrys javanicus Evermann & Seale, Bull. Bureau Fish. XXVI. 1906, p. 105.
? *Pseudorhombus javanicus* Jenkins, Mem. Indian Mus. III. N°. 1, 1910, p. 24.
Pseudorhombus javanicus M. Weber, Siboga-Exp. Fische, 1913, p. 424.

D. 69—73; A. 50—56; P. sin. 2.7.2; P. dextr. 6—7; V. 2.4—3.3; L.l. 67—74.

Rather elongate, dorsal profile either gently sloping upwards or somewhat arched above eyes. Height 2—2.5, 2.5—2.9 in

length with caudal. Head 3.1—3.5, 3.7—4.1 in length with caudal. Eyes 3.4—4.5, nearly equal, the upper one above, somewhat before or somewhat behind the lower one, equal to snout; twice or more than twice in postorbital part of head, separated by narrow bony ridge only. Upper jaw with a row of pointed teeth, the anterior ones longer, caninoid and less crowded. Lower jaw with about 15 somewhat distant teeth of moderate length in left half, about 20—25 in right half. Maxillary scaly on coloured side, 1.8—2.3 in head, reaching to below middle of eye. Tongue smooth. Origin of dorsal beginning on blind side, distinctly in advance of anterior nostril; a straight line through origin of dorsal and posterior nostril does not touch the maxillary. Dorsal and anal rays small, excepting the hindermost scaled, the subposterior ones the longest. Origin of anal in vertical through hindborder of operculum. Praeanal spine well developed, pierced through the skin. Dorsal and anal ending close to caudal, which is bluntly pointed. Scales ctenoid on anterior half of coloured side, cycloid on its posterior part and on whole of blind side, covering the head with exception of the snout. The forward prolongation of the lateral line reaches the upper profile at the 10th or 11th dorsal ray. Left pectoral much longer than right one, equal to or longer than postorbital part of head. Right pectoral equal to snout and eye or to postorbital part of head. Ventrals slightly shorter than right pectoral. Eleven compressed lanceolate gillrakers, dentated behind and preceded by 2 or 3 short knob-like ones on lower branch of anterior arch, one third of eye. Colour of alcohol specimens reddish brown, generally with a large dark blotch, speckled or surrounded by white dots, on lateral line just behind its curve. A smaller one, more posteriorly on lateral line sometimes visible. Fins more or less spotted with brown. Length 210 mm.

Nom. indig.: Mata sablah (Malay).

Habitat: Java (Batavia!); Java-sea (different localities 12—36 M.!); Borneo (Sandakan); Celebes (Makassar!). — Malacca Strait 29—32 M.!, Philippines, Coromandel coast.

8. **Pseudorhombus affinis** M. Web. [Fig. 25, p. 99].

Pseudorhombus affinis M. Weber, Siboga-Exp. Fische 1913, p. 426.

D. 66—76; A. 51—54; P. sin. 2.9.1; P. dextr. 11; V. 2.4; L.l. 70—76.

Dorsal profile rather strongly ascending, somewhat more arched than ventral profile. Height 1.8—2.2, 2.2—2.7 in length with caudal. Head 3.2—3.4, 4—4.3 in length with caudal. Eye somewhat more or less than 4, somewhat shorter than snout, 1.8—2 in postorbital part of head, separated by a rather low narrow bony ridge. Upper orbit somewhat larger than lower one, but eyes equal and above each other. A single series of small teeth in both jaws. Maxillary reaching to about middle of eye, scaly on coloured side, 2—2.2 in head. A single series of minute crowded teeth in upper and lower jaw. Tongue smooth. Origin of dorsal beginning on blind side, above anterior nostril. A line through origin of dorsal and posterior nostril does not reach the maxillary. Origin of anal slightly before vertical through hindborder of operculum. Praeanal spine well developed. All dorsal rays and all anal rays, excepting the hindermost, simple, the subposterior rays of both fins are slightly longer than the others. Scales ctenoid on coloured side, cycloid on blind side, covering head with exception of the snout. Forward prolongation of lateral line reaches upper profile at 8th, 9th or 10th dorsal ray. Left pectoral as long as head without snout, right pectoral equal to postorbital part of head, ventrals somewhat more or less than snout and eye together. Caudal obtusely pointed. Eleven compressed lanceolate gillrakers, dentated behind, not quite half as long as eye, on lower branch of first arch. Colour of alcohol specimens light brownish red, with three dark blotches on lateral line, the first just behind its curve, one below end of dorsal and the other between them. Two similar blotches above and below lateral line, somewhat in front of the first one. All these blotches are more or less speckled with white. Less distinct brown rings are scattered on the body. A dark spot at the beginning of the lateral line. Dorsal and anal with 4—5 black blotches freckled with white and some smaller spots, which also occur on the caudal. Length 150 mm.

Habitat: Saleyer 18—45 M.!; Flores!. — Malacca Strait 18—32 M.!. In sea on sand- and mud-bottom.

9. Pseudorhombus neglectus Blkr.

Pseudorhombus neglectus Bleeker, Ned. Tijdschr. Dierk. III. 1866, p. 44; Atl. ichth. VI. 1866—1872, p. 8.

Platophrys neglectus Evermann & Seale, Bull. Bureau Fish. XXVI. 1906, p. 105.

Pseudorhombus neglectus M. Weber, Siboga-Exp. Fische 1913, p. 424.

D. 68—75; A. 53—59; P. sin. 2.9.2 or 2.10; P. dextr. 12; V. 2.3.1; L.l. 74—80.

Rather elongate, dorsal profile either gently sloping upwards or sometimes arched above eyes. Height 1.9—2.2, 2.3—2.7 in length with caudal. Head 3.2—3.7, 3.7—4.6 in length with caudal. Eyes 3.8—4.5, nearly equal, above each other, separated by a narrow rather elevated bony ridge, longer than snout, more than twice to 2.5 in postorbital part of head. A row of conical teeth in the upper jaw, the anterior ones longer, the posterior ones smaller and more crowded; about 15 conical teeth in the lower jaw, equal to the anterior ones in the upper jaw. Maxillary with some scales on coloured side, 1.9—2.4 in head, reaching to middle of eye or somewhat farther. Tongue smooth. Origin of dorsal beginning on blind side, above posterior nostril, a line connecting both reaches the anterior half of the maxillary. Dorsal and anal rays simple, the sub-posterior ones the longest. Origin of anal somewhat before vertical through hindborder of operculum. Praeanal spine absent or minute, hidden below the skin. Dorsal and anal ending close to caudal, which is bluntly pointed. Scales ctenoid on left side, cycloid on blind side, covering the head with exception of the snout. The forward prolongation of the lateral line reaches the upper profile between the 7th and 8th dorsal ray. Left pectoral equal to or somewhat more than postorbital part of head, right pectoral equal to eye and snout. Ventrals somewhat shorter than that distance. Nine (in type) — 12 compressed, bluntly lanceolate gillrakers, dentated behind, one third of eye. Colour of alcohol specimens brown, with two dark blotches, often encircled by white, one above the lateral line just behind its curve, the other on lateral line below last third of dorsal. In young specimens dark ocelli scattered on the body. Fins with brown markings. Length almost 200 mm. [Type of the species in the Leiden Museum seen by us].

Nom. indig.: ladhjilā (Madurese).

Habitat: South Chinese sea!; Riou-strait!; Banka!; Java (coast of Indramaju!); Java-sea to 36 M.!; Strait Madura!; Madura-sea 100 M.!; Strait Makassar!. — Philippines.

Note. A small specimen, probably belonging to this species, has cycloid scales on both sides.

10. **Pseudorhombus argus** M. Web. [Fig. 27, p. 113].

Pseudorhombus argus M. Weber, Siboga-Exped. Fische, 1913, p. 425.

D. 69; A. 53; P. sin. 2.8.1; P. dextr. 10; V. 2.4; L.l. 72. Dorsal profile more convex than ventral one. Profile of snout notched before eye. Height 1.9, 2.4 in length with caudal. Head 3.7, 4.7 in length with caudal. Eyes almost equal, 3.7 in head, longer than snout, twice in postorbital part of head, separated by an elevated narrow bony ridge. Upper eye slightly in advance of lower one. About 18—20 small pointed teeth

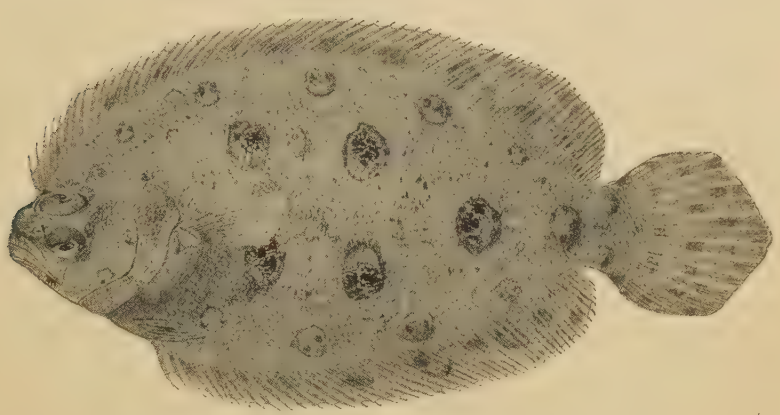

Fig. 27. *Pseudorhombus argus* M. Web. about $^2/_3$ n.s.

in both jaws. Maxillary with some scales on coloured side, reaching to below middle of eye, about twice in head. Origin of dorsal beginning on blind side, behind posterior nostril, a line, connecting both reaches anterior half of maxillary. Origin of anal in vertical through hindborder of operculum. No praeanal spine. Subposterior dorsal and anal rays longest, all rays simple, excepting the hindermost, and scaly. Scales ctenoid on coloured side, cycloid on blind side, covering head with exception of the snout. Forward prolongation of lateral line reaches dorsal profile between 9th and 10th dorsal ray. Left pectoral as long as head without snout, right one as long as eye and snout together, ventrals slightly shorter. Twelve short conical, compressed and somewhat dentated gillrakers on lower branch of first arch. Colour of alcohol specimen light pink brown, with five large ocelli, disposed thus : : · , the hindermost on lateral line and consisting of black patches, freckled

with white and surrounded at some distance by a brown ring. A sixth, less distinct one on caudal peduncle, 4 similar ones along base of dorsal and three along base of anal, besides some smaller ones scattered on body. Fins freckled. Length of single specimen known 160 mm.

Habitat: Jedan-islands, eastside of Aru-islands 13 M.!

11. Pseudorhombus pentophthalmus Gthr.

Pseudorhombus pentophthalmus Günther, Cat. Brit. Mus. IV. 1862, p. 428.
Pseudorhombus pentophthalmus Jordan & Starks, Bull. U. S. Fish. Comm. XXII. (1902) 1904, p. 626.
Pseudorhombus pentophthalmus Fowler & Bean, Proc. U. S. Nat. Mus. vol. 62 1922, p. 66.

D. 69—70; A. 53—54; P. sin. 1.10.2; P. dextr. 11; V. 2.4; L.l. 73—75.

Dorsal and ventral profile evenly convex. Height 1.9—2, 2.4—2.5 in length with caudal. Head 3.2—3.3, about 4 in length with caudal. Eyes about equal, situated above each other, 4.6 in head, equal to snout, twice in postorbital part of head, separated by a narrow bony ridge, the axis of which, when continued backwards, reaches the caudal. Maxillary scaly on coloured side, reaching scarcely behind middle of eye, twice in head. Mouth strongly oblique. Upper jaw with two pairs of small canines, curved backwards in front, followed by some smaller teeth. Small distant canines in lower jaw. Origin of dorsal beginning on blind side, above posterior nostril. A line through both reaches maxillary. All dorsal and anal rays simple, scaly, the subposterior rays the longest. Origin of anal slightly behind vertical through hindborder of operculum. A strong praeanal spine, pierced through the skin. Scales ctenoid on coloured side, cycloid on blind side, covering the head with exception of the snout. The forward prolongation of the lateral line reaches the upper profile at the 7th dorsal ray. About 15 scales between top of curve of lateral line and dorsal profile. Left pectoral equal to postorbital part of head, right one less than snout and eye. Ventrals scarcely shorter. Height of caudal peduncle less than eye and snout. Thirteen slender gillrakers, less than half eye, dentated behind, preceded by 5 smaller ones on lower branch of first arch. Colour of alcohol specimens light brown. Five black blotches on body, disposed thus : : · , the hindermost on lateral line, the others above

and below lateral line, the upper anterior one on top of curve of lateral line. The blotches are surrounded by chalk white spots and at some distance by a dark line. Some brown rings at base of dorsal and anal and smaller ones scattered on body, which has moreover brown spots here and there. Unpaired fins with brown streaks. Length 110 mm.

Habitat: Java-sea near Kangeang Islands 12—36 M.! — Japan, China!, Formosa.

Note. We examined the type in the British Museum, which is a young specimen of 90 mm. length. Our specimen from the Java-sea is not much larger and it is quite possible, that when adult, the maxillary reaches to hindborder of eye, as is stated in the description by JORDAN & STARKS l. c. of a specimen of 130 mm. Large specimens must therefore be very much like our *P. quinquocellatus*, although lastnamed species differs by having less gillrakers.

Doubtful species

1. Pseudorhombus guttulatus Macl.

Pseudorhombus guttulatus Macleay, Proc. Linn. Soc. N. South Wales VIII. 1883, p. 276.

D. 75; A. 63.

The height of the body is nearly half the total length. The dorsal fin commences in front of the eyes, which are large, almost in the same plane, and separated by a narrow ridge. Teeth acute, sloping backwards. Colour (in spirits) uniform grey, fins lighter, the whole covered with minute brown dots. Length 100 mm.

Hood Bay, New Guinea.

The description of MACLEAY is too short to form an opinion on the position of this species.

2. Laeops Günther.

(GÜNTHER, Challenger Rep. Zool. I. part VI. Shore-fishes 1880, p. 29).

Eyes on the left side. Mouth small or moderate. Teeth in jaws, in narrow villiform bands. Dentition much more developed on blind side than on the coloured. Palate edentulous. Eyes close together. Scales small, thin, deciduous. Dorsal beginning on snout. Lateral line with a curve anteriorly.

Base of left ventral long, in same line as anal, that of right one short. Gillopenings moderately broad, the membranes united anteriorly and rather broadly. Gillrakers sufficiently numerous, short, pointed.

Distribution: Gulf of Aden, Sea of Oman, Arabian Sea, Bay of Bengal, Japan, Arafura sea and coasts of Australia.

1. **Laeops parviceps** Gthr. [Fig. 28, p. 116].

Laeops parviceps Günther, Challenger Rep. Zool. I. part VI. Shore-fishes, 1880, p. 29.
Laeops parviceps Mc Culloch, Check-list of fish & fish-like animals of N. S. Wales, Part II. 1919, p. 36.

D. 104; A. 86; P. sin. 13; P. dextr. 12; V. 6; L.l. 94.

Height 2.6, 3.2 in length with caudal. Head 5.2, nearly 6 in length with caudal. Eyes 3.3 in head. A very narrow ridge longitudinally grooved, separates the two eyes, the lower being conspicuously in advance of the upper. The mouth is directed

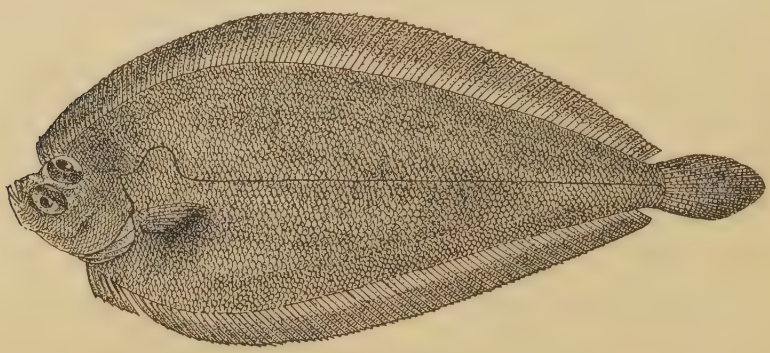

Fig. 28. *Laeops parviceps* Gthr. [After GÜNTHER].

upwards, and the maxillary of the left side extends scarcely to below the anterior margin of the eye. The dorsal fin commences opposite to the frontmargin of the upper eye and is continued to the root of the caudal, the rays being of moderate length. Caudal rounded. The left pectoral rather longer than the right, as long as postorbital part of head. Colour uniform brown. Length 140 mm. [Type of the species in British Museum examined by us].

Habitat: Arafura-sea 63—88 M.! — S. E. Australia, 216 M.

3. **Bothus** Rafinesque.

(RAFINESQUE, Caratteri di Alcuni Nuovi Generi e Nuove Specie di Animale e Piante della Sicilia, 1810, p. 23).

Platophrys Swainson, Nat. Hist. II. 1839, p. 302.
Rhomboidichthys Bleeker, Act. Soc. Sci. Indo-Neerl. I. 1856, Menado & Makassar, p. 67.
Engyprosopon Günther, Cat. Brit. Mus. IV. 1862, p. 431.
Arnoglossus [1]) Bleeker, Verh. Akad. Amsterdam XIII. 1862, p. 427.
Anticitharus Günther, Challenger Rep. Part VI. Shore Fishes, 1880, p. 47.
Scaeops Jordan & Starks, Bull. U. S. Fish Comm. XXII. 1904, p. 627.

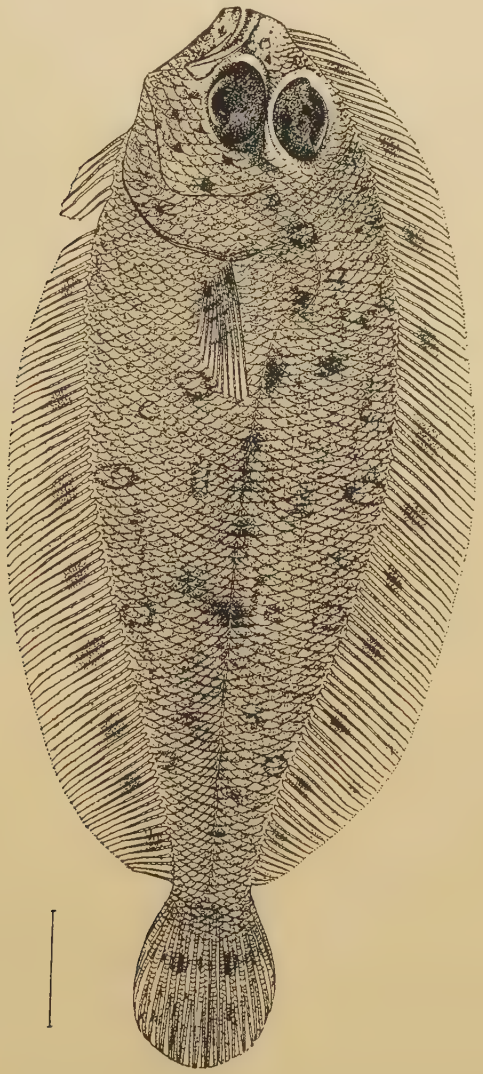

Fig. 29. *Bothus elongatus* (M. Web.) × 1 1/2.

1) Bleeker's statement "Oculi dextri" must be a misprint.

Eyes normally on left side, close to each other or wide apart, sometimes different in their mutual position according to sex. Mouth moderate or small. Teeth in jaws small, pointed, in one or two series. Sometimes distant caninoid teeth are present. Palate edentulous. Scales small, moderate or rather large, generally ctenoid on coloured side, cycloid on blind side. Dorsal beginning on snout, its anterior rays sometimes prolonged in males. Lateral line with a strong curve anteriorly. Left ventral median with an elongated base forming a prolongation of the anal, with which it is not united. Right ventral lateral, short-based, beginning behind origin of left one. Pectoral rays sometimes filamentous in males. Gillrakers generally small and thick, sometimes longer and slender. Gillmembranes free from isthmus.

Distribution: Almost cosmopolitic.

Note. The species described under the generic name *Psettylis* (Alcock, Ann. & Mag. Nat. Hist. (6) VI. 1890, p. 437) are very probably larval stages of *Bothus* (see M. Weber, Siboga Exp. Fische 1913, p. 412, footnote 2.

Key to the indo-australian species of Bothus.

A. Lateral line 77—120. Height generally less than 2 (*Platophrys* auct.).
- I. Eyes very close together. L.l. 77—83 . . . . . *B. polyophthalmus* p. 119.
- II. Eyes separate. Interorbital space scaly.
  - *a.* L.l. about 120. Blind side with dark transverse bars . . . . . *B. myriaster* p. 120.
  - *b.* L.l. 82—95. Blind side uniform, colourless.
    - *α.* D. 98—103. A. 98—99. L.l. 90—95. . . . *B. mancus* p. 122.
    - *β.* D. 86—93. A. 65—70. L.l. 82—87 . . . . *B. pantherinus* p. 123.

B. Lateral line 70—75. Scales cycloid on both sides. D. 97—106. A. 76—82. Caninoid teeth present *(Anticitharus)* . . . . . *B. polyspilus* p. 124.

C. Lateral line 40—65. Scales at least partly ctenoid on coloured side. Height generally more than 2 *(Arnoglossus)*.
- I. Lateral line 63—65. D. 100—102. A. 78—79. Height nearly 3. Caninoid teeth present. . . . . *B. elongatus* p. 125.
- II. Lateral line 48—61.
  - 1. D. 90—95. A. 70—72.

a. Maxillary scarcely reaching to frontborder of eye. Height 1.8 . . . . . *B. microstoma* p. 126.

b. Maxillary reaching below anterior third of eye. Height 2.2. Teeth rather strong . . . . *B. profundus* p. 127.

2. D. 83—90. A. 65—70. Height 2.5—3.1. First dorsal rays of males filamentous . . . . . *B. tapeinosoma* p. 127.

3. D. 76—84. A. 58—62. Mouth small, maxillary reaching to frontborder of eye or somewhat before or beyond.

a. Teeth in two rows in upper jaw . . . . . *B. mogki* p. 128.

b. Teeth in one row in both jaws.

α. Eyes separated by a ridge only. A. 60—62. L.l. 55 . . . . . *B. brevirictis* p. 129.

β. Eyes separated by a scaly interspace. A. 55—60. L.l. 48—54 . . . . . *B. intermedius* p. 130.

III. Lateral line 40—48.

1. Interorbital space broad. Teeth in two rows in upper jaw and posterior part of lower jaw. *B. poecilurus* p. 131.

2. Interorbital space narrow. Teeth in a single row. *B. aspilus* p. 132.

1. Bothus (Platophrys) polyophthalmus (Blkr.).

Platophrys (Platophrys) polyophthalmus Bleeker, Ned. Tijdschr. Dierk. III. 1866, p. 46. — Atl. ichth. VI. 1866—1872, p. 12.

Rhomboidichthys angustifrons Günther, Challenger Exp. Zool. vol. I. Part VI, Shore Fishes 1880, p. 46.

Platophrys polyophthalmus Mc Culloch, Mem. Queensl. Mus. VII. Part IV, 1922, p. 244.

D. 77—85; A. 61—68; P. sin. 17—13; P. dextr. 11—14; V. 6; L.l. 77—83.

Oval, dorsal profile arched, strongly ascending from snout, where it is notched. Height 1.5—1.7, 1.8—2.1 in length with caudal. Head 3.3—4, 3.9—4.9 in length with caudal. Eyes 2.7—3.6 in head, longer than snout, the lower one more or less in advance of the upper one, separated by a narrow elevated bony ridge. Mouth oblique, curved. Maxillary reaching to frontborder of eye, about equal to diameter of eye. A single row of conical teeth in both jaws, equally developed on both sides. Dorsal beginning on blind side on snout, the first 8—10 rays only connected at the base and produced into filaments in some specimens, probably the males. All rays of dorsal and anal simple, those of caudal forked. Origin of anal slightly behind vertical through hindborder of praeoperculum. Sub-

posterior rays of dorsal (when the first ones are not produced) and anal the longest. Left pectoral as long as head without snout, in the supposed males the second ray is produced and somewhat longer than head. Right pectoral equal to eye and snout. First ray of right ventral opposite to third one of left side, their length subequal, the longest rays equal to snout and eye. Caudal bluntly pointed. Scales ctenoid on coloured side, cycloid on blind side. Head totally scaled on both sides. Unpaired fins scaly on coloured side. Six rudimentary gill-rakers on lower branch of first arch. Colour of alcohol specimens brownish, with three ocelli, one on lateral line in the beginning of its posterior half, and two in the same vertical above and below the posterior part of the curve of lateral line. The two lastnamed ocelli consist of a dark brown round patch, encircled by a chalky white line, which again is surrounded by a dark area, covered with chalky spots on its cranial part. The third ocellus has the same design, but the dark centre is crossed by a white stripe on the lateral line. Moreover the body is covered by small bluish or brownish spots or ocelli. Dark markings on dorsal, anal and less distinct on caudal. Pectoral of left side with indistinct darker cross-bars. Length 155 mm.

Habitat: Sumatra (Oleh-leh!); many localities in Java-sea 16–64 M.! (collected by Fisheries-investigation Steamer "Gier"); Arafura Sea 54 M. — Malacca Strait!, Ceylon, Queensland.

2. **Bothus (Platophrys) myriaster** (Temm. & Schl.).

Rhombus myriaster Temminck & Schlegel, Fauna Japonica, Poissons 1846, p. 181.
Rhomboidichthys myriaster Bleeker, Act. Soc. Sc. Ind. Neerl. I. 1856, Beschrijv. vischsoorten Menado etc. p. 67.
Bothus Bleekeri Steindachner, Ichth. Mitth. III. Verhandl. zool. bot. Ges. Wien XI. 1861, p. 179.
Rhomboidichthys myriaster Günther, Cat. Brit. Mus. IV. 1862, p. 436.
Platophrys (Platophrys) myriaster Bleeker, Atl. ichth. VI. 1866—1872, p. 10.
Platophrys myriaster Steindachner, Denkschr. Akad. Wien LXXI. 1902, p. 152.
Platophrys myriaster Jordan & Evermann, Proc. U.S. Nat. Mus. XXV. 1902, p. 365.
Platophrys myriaster Jordan & Starks, Proc. U.S. Nat. Mus. XXXI. 1906, p. 167.
Platophrys (myriaster) M. Weber, Siboga-Exped. Fische, 1913, p. 428 (larval stage).
Platophrys myriaster Hubbs, Proc. U. S. Nat. Mus. XLVIII. 1915, p. 457.

D. 88—89; A. 65; P. sin. 7—9; P. dextr. 8—9; V. 6; L.l. about 120.

Oval, dorsal profile very elevated. Height 1.4—1.6, 1.7—2 in length with caudal. Head 3.4 to nearly 4, 3.9 to nearly 5 in length with caudal. Hindborder of lower eye below middle of upper eye. Eyes almost 3 in head, equal to or 1.2 in interorbital space, which is scaled and somewhat concave. Snout much shorter than eye. Maxillary reaching to below frontborder of eye, 3.1—3.3 in head. Mouth small, curved, very oblique. Lower jaw slightly prominent, with a symphysial knob. Teeth small, pointed, in two irregular series in the jaws. Dorsal beginning on blind side on the snout, anal beginning about in vertical through hindborder of upper eye. A flat praeanal spine present. Dorsal and anal rays simple, caudal rays forked. Subposterior dorsal and anal rays the longest. Second and third or second, third and fourth ray of left pectoral with long filaments, half as long as length with caudal. Right pectoral as long as head without snout. First ventral ray of blind side opposite to fourth of coloured side; the rays of this side are somewhat longer than those of the other ventral and equal to snout and eye. Caudal obtusely pointed. Scales cycloid, deciduous, excepting those along the dorsal and anal on coloured side, which are adherent and ctenoid. About five knoblike distant gillrakers on lower branch of first arch. Colour of alcohol specimens on left side reddish brown, with a dark blotch on lateral line, behind its middle, sometimes an ocellus just behind bent of lateral line. Some dark spots are scattered over the body. Similar spots, regularly arranged with an interspace of about 12 rays on dorsal and anal. Distal part of caudal dark-brown. Blind side light reddish in anterior part, dark reddish in posterior part, before this dark part some transverse dark bands are visible, bent in the middle. In life the blind side is orange yellow and the bands appear as blue stripes according to BLEEKER. Length 160 mm.

Habitat: Sumatra (between Oleleh and Pulu Baru!); Java's East point 65—54 M.!; Celebes (Menado); Amboina; West-Ceram 36 M.! — Southern Japan, Riu-Kiu Islands, China, Formosa, South Arabia and Zanzibar.

Note. One of us (Siboga Exp. Fische 1913, p. 428) has discussed the supposed larval stage of this species and its probable identity with ALCOCK's *Psettylis ocellata*. See also HUBBS, Proc. U. S. Nat. Mus. 48, 1915, p. 457.

3. Bothus (Platophrys) mancus (Brouss.).

Pleuronectes mancus Broussonet, Ichthyol. Piscium. Descr. et Icon. 4° London, 1782.
?? *Rhombus macropterus* Quoy & Gaimard, Voyage de l'Uranie et de la Physicienne, 1824, p. 236.
Rhombus pavo Bleeker, Nat. Tijdschr. Ned. Indië VIII. 1855, p. 177.
Rhomboidichthys pavo Günther, Cat. Brit. Mus. VI. 1862, p. 435.
Platophrys (Platophrys) pavo Bleeker, Atl. ichth. VI. 1866—1872, p. 11.
Platophrys pavo Steindachner, Denkschr. Akad. Wien LXX. 1900, p. 510.
Platophrys pavo Seale, Occas. Papers Bernice Pauahi Bishop Museum I. 1901, p. 128.
Platophrys mancus Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 513.
Platophrys mancus Jordan & Seale, Bull. Bur. of Fish. Wash. XXV. (1905) 1906, p. 412.
Rhomboidichthys mancus Günther, Fische der Südsee, Heft VIII. 1909, p. 342.
Platophrys mancus Kendall & Goldsborough, Mem. Mus. Compar. Zool. Harvard Coll. vol. XXVI. N°. 7, 1911, p. 331.

D. 98—103, A. 78—79; P. sin. 13—12; P. dextr. 13—11; V. 6; L.l. 90—95.

Dorsal and ventral profile evenly convex, with a feeble notch above intermaxillaries. Height 1.7—2, 2—2.3 in length with caudal. Head 3.3—3.5, 4.2—4.3 in length with caudal. Posterior border of lower eye scarcely behind vertical through anterior border of upper eye. Eyes 5—7 in head, 1.5 in somewhat concave interorbital space, which is scaled. Snout somewhat more than eye. Maxillary not reaching to below middle of eye, 3.4 in head. Mouth curved, very oblique. Lower jaw slightly prominent, with a symphysial knob. Teeth small, pointed, curved backwards, in one series in the jaws, with some teeth behind this series near symphysis. Dorsal beginning on blind side on snout. Subposterior rays of dorsal and anal the longest. Anal beginning halfway between vertical through hindborder of upper eye and hindborder of operculum. Dorsal and anal rays simple, those of caudal forked. Left pectoral as long as head without snout, right one as long as postorbital part of head, second ray sometimes produced (males?) and longer than head. First ventral ray of blind side opposite to fourth one of coloured side; longest ventral rays somewhat more than interorbital space. Caudal obtusely pointed. Scales ctenoid on coloured side, cycloid on blind side, covering head with exception of snout. Colour of alcohol specimens light brownish, with numerous margaritaceous round ocelli, bordered by dark brown and often with a white spot in the middle. Four large dark

blotches on lateral line, and smaller ones in a row below and above lateral line as well as on head. Dorsal, anal, caudal and left ventral variegated with white spots and with dark blotches. Left pectoral irregularly barred with darkbrown. Right side, right pectoral and ventral colourless. Length 400 mm.

Habitat: Island Binongka!, New Guinea?. — Cocos islands, Mauritius, Indian Ocean, China, Philippines to Hawaiian Islands, Marshall and Paumotu Islands.

4. **Bothus (Platophrys) pantherinus** (Rüpp.).

Rhombus pantherinus Rüppell, Atlas Reise Nördl. Afrika, Fische, 1821, p. 121.
? *Rhombus parvimanus* Bennett, Proc. of the Comm. Zool. Soc. London I, 1830, p. 168.
Rhombus sumatranus Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 409.
Psetta pantherina Rüppell, Verzeichn. Samml. Senckenberg. Mus. 1852, p. 19.
Rhomboidichthys pantherinus Günther, Cat. Brit. Mus. IV. 1862, p. 436.
Pseudorhombus pantherinus Bleeker, Versl. Akad. Amsterdam XIV, 1862, p. 103.
Platophrys (Platophrys) pantherinus Bleeker, Atl. ichth. VI. 1866—1872, p. 11.
Rhomboidichthys pantherinus Klunzinger, Verhandl. zool.-bot. Ges. Wien, Bd. XXI. 1871, p. 571.
Platophrys pantherina Day, Fishes of India 4°, 1878—1888, p. 425.
Platophrys pantherinus Waite, Mem. Austr. Mus. III. prt. 9, 1899, p. 546.
Platophrys pantherinus Steindachner, Denkschr. Akad. Wien LXX. 1900, p. 511.
Platophrys pantherinus Steindachner, Denkschr. Akad. Wien LXXI. 1902, p. 153.
Platophrys pantherinus Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 512.
Platophrys pantherinus Jordan & Seale, Bull. Bureau Fish. Wash. vol. XXV. (1905) 1906, p. 412.
Rhomboidichthys pantherinus Günther, Fische der Südsee, Heft VIII. 1909, p. 342.
Platophrys pantherinus Kendall & Goldsborough, Mem. Mus. Compar. Zool. Harvard Coll. vol. XXVI. N°. 7, 1911, p. 332.
Rhomboidichthys pantherinus Pellegrin, Ann. Mus. Zool. R. Univ. Napoli, vol. 3, n. 27, 1912, p. 9.
Platophrys pantherinus M. Weber, Siboga-Exped. Fische, 1913, p. 427.
Bothus pantherinus Tate Regan, Ann. Durban Mus. vol. II. part 5, 1920, p. 212.
Platophrys pantherinus Mc Culloch, Mem. Queensl. Mus. VII. Part IV. 1922, p. 244.

D. 86—93; A. 65—70; P. sin. 11—10; P. dextr. 10—9; V. 6; L.l. 82—87.

Oval, dorsal profile sloping in a more or less abrupt curve to snout. Height 1.7—1.8, 2—2.2 in length with caudal. Head 3.3—3.7, 3.7—4.3 in length with caudal. Eyes 3.3—4.2, equal to or somewhat more than interorbital space, about equal to snout. The vertical through frontborder of upper eye goes through middle of lower one. A small fleshy tentacle on eye-

lid. In old males the orbital rim, especially of the lower eye, has some bifurcate dentations and there is a bifurcate tubercle on snout below anterior nostril. Lower jaw slightly prominent, no distinct symphysial knob. Mouth rather oblique, curved. Maxillary reaching to below frontborder of eye or somewhat farther, 2.5—2.8 in head. Teeth pointed, curved, in two series in both jaws. Dorsal beginning on blind side on the snout, anal beginning in vertical through middle of operculum. No praeanal spine. Subposterior dorsal and anal rays the longest. In males the membrane between the first 8 or 9 dorsal rays is scalloped, the upper part of these rays being free or clypeated. All dorsal and anal rays simple, those of caudal forked. Right pectoral equal to postorbital part of head, left one half eye-diameter longer in females; in males the second and third or second to fourth rays of left pectoral are filamentous and reach to caudal peduncle. First ray of right ventral opposite to fourth one of left ventral. Rays of left ventral longer than that of right one and longer than snout. Caudal obtusely pointed. Scales ctenoid on left side, cycloid on blind side. About 6 club-shaped short gillrakers, less than one third of eye, in lower branch of first arch. Colour of alcohol specimens brownish or reddish, with irregular dark blotches and ocelli. A large dark blotch on caudal half of lateral line generally very conspicuous and almost forming a transverse band in small specimens. Fins mottled with dark brown. Length 237 mm.

Habitat: Pulu Weh!; Sumatra (Oleleh!, Deli!, Ulakan, Priaman, Siboga); Nias!; Batu-islands; Java! (East point 54—64 M.!, Prigi); Bali; Lombok 33 M.!; Celebes (Menado!); Saleyer 18—45 M.!; Buton!; Flores; Solor!; Karakelang island!; Binongka!; Sula islands!; Obi major!; Batjan; Morotai; Buru; Ceram; Amboina!; Saparua; Banda islands; Kei islands!; Aru islands!; Waigeu!; Mysore. — From East Africa and Red Sea to Philippines and Japan, North Australia, New Caledonia, Pacific to Hawaian islands, Tahiti (Vaillant).

5. **Bothus (Anticitharus) polyspilus** (Gthr.).

Anticitharus polyspilus Günther, Challenger Rep. Zool. vol. I. Part VI. Shore Fishes, 1880, p. 48.

Anticitharus polyspilus M. Weber, Siboga-Exped. Fische, 1913, p. 433.

D. 97—106; A. 76—82; P. sin. 14—12; P. dextr. 9; V. 6; L.l. 70—75.

Height 2.6—2.9, 3.1—3.4 in length with caudal. Head 3.7, 4.2—4.4 in length with caudal. Eye 3.2—5.8, the lower one in advance of the upper one, separated by a scaleless ridge, in front of which are the two nostrils, the anterior with a flap. The nostrils on blind side have the same arrangement and are situated before origin of dorsal. Snout as long as or shorter than eye. Mouth oblique, lower jaw with a knob at the symphysis. The maxillary extends to below front margin or middle of eye, 2.1—2.3 in head. Teeth in one row in both jaws, longer and more distant in the lower jaw; the anterior ones in the upper jaw are caninoid. Origin of dorsal on the snout. Dorsal and anal ending very close to caudal. Pectoral of left side equal to postorbital part of head, that of blind side equal to eye. Ventrals separate, that of the right side beginning opposite the 4th ray of left side. Scales deciduous, cycloid on both sides. Colour of alcohol specimens yellowish on both sides, with a dark band or dark more or less distinct spots along dorsal and ventral outline and along middle of body on coloured side. Length 212 mm. [Type of species in British Museum seen by us].

Habitat: South coast of Java 90 M.!; Kei-Islands 252 M.!; Timor sea 216 M.!

6. **Bothus (Arnoglossus) elongatus** (M. Web.) [Fig. 29, p. 117].

Arnoglossus elongatus M. Weber, Siboga-Exped., Fische, 1913, p. 431.

B. 6; D. 100—102; A. 78—79; P. dextr. 10; P. sin. 1.11; V. 6; C. 17; L.l. 63—65; L. tr. $\frac{12}{1}$.
$\frac{}{18}$

Height nearly 3, (or less, see note) 3.3 in length with caudal. Head 3.5, 4.1 in length with caudal. Snout two thirds of eye. Eyes 3, separated by a very narrow elevated ridge; the lower one scarcely in advance of the upper one. Maxillary nearly 2.5 in head, reaching below anterior half of eye. A single series of equal acute strong teeth in both jaws. Origin of dorsal before eye. Caudal rounded. Left pectoral longer than postorbital part of head, right pectoral shorter. The left ventral reaches from isthmus to anal, the right one is much shorter. All finrays simple. Unpaired fins scaly. Scales ctenoid on coloured side, cycloid on blind side. Six to seven thin, rather long rod-like gillrakers on lower branch of first arch. Colour

of alcohol specimens yellowish brown, freckled with darker points and spots; some oval or round rings along base of dorsal and anal and a few also on body. Length 90 mm.

Habitat: Madura-sea 100 M.!; Madura strait!; Bali? 108—162 M.

Note. Among the five specimens, on which one of us based this species, one of 65 mm. length has the profile of the head more elevated and the height goes 2.5 in the length. D. 97. A. 78. We have examined a specimen from Nikolaas-bay, Bali, collected by the S.S. "Gier" of 115 mm. length, where the height goes 2.4 in the length. L.l. 61, D. 97, A. 80. Eyes separated by a very narrow hollow interorbital space, which is scaled (male?). Were it not for the high number of dorsal and anal rays, we would range this specimen under *B. profundus*, which was caught at the same locality by the S.S. "Gier". These two specimens are somewhat intermediate between *B. elongatus* and *B. profundus*. We range them provisionally under the former, as the differences between typical specimens of both species are so striking, that it does not seem advisable to unite these species at present. When more material will be available it may turn out that they gradually merge from one into the other, or that the two specimens mentioned above represent a new species.

7. **Bothus (Arnoglossus) microstoma** (M. Web.).

Platophrys microstoma M. Weber, Siboga-Exped., Fische, 1913, p. 427.

D. 90; A. 72; P. sin. 11; P. dextr. 10; V. 6; L.l. 55—57; L. tr. $\frac{21}{1}$.
$\frac{}{24}$

Height 1.8, 2.3 in length with caudal. Head 3.7, 4.5 in length with caudal. Eyes 3, separated by a scaly interspace equal to $^2/_5$ of diameter of eye. Lower eye somewhat in advance of upper one. Snout much shorter than eye. Mouth very small, oblique. Maxillary scarcely reaching to frontborder of eye, 3.5 in head. A single row of small pointed teeth in both jaws. Origin of dorsal on blind side on snout, its longest rays are in its posterior half and equal to postorbital part of head. Origin of anal in vertical through hindborder of operculum, its rays not much shorter than those of dorsal. Left pectoral

as long as head without snout, the right one equal to snout and eye. First ventral ray of right side opposite to fifth ray of left side. Caudal bluntly pointed. Scales of coloured side ctenoid, of blind side cycloid [1]). Gillrakers very short and thick. Colour of alcohol specimens yellowish brown with indications of three large, transversally expanded, dark postpectoral patches. Scattered over the body round whitish spots, surrounded by dark, partially confluent and as large as pupil. Unpaired fins with roundish white and smaller oval dark spots. Blind side colourless. Length of single specimen known 62 mm.

Habitat: Island Jedan, off Aru-islands 13 M.!

8. **Bothus (Arnoglossus) profundus** (M. Web.).

Arnoglossus profundus M. Weber, Siboga-Exped. Fische, 1913, p. 430.

B. 6; D. 90—95; A. 70—73; P. dextr. 6—9; P. sin. 1.9—11; V. 6; C. 17; L.l. 55—60; L. tr. ca. $\frac{15}{1}$.
$\frac{}{10}$

Height 2.2—2.4, 2.6—2.9 in length with caudal. Head 3.4—3.8, 4—4.7 in length with caudal. Eye about 3, separated by a rather narrow scaly space (male) or a bony ridge (female). The lower eye is well in advance of the upper one. Lower jaw slightly prominent. Maxillary about 3 in head, reaching below anterior third of eye. Jaws with a single series of equal pointed teeth. Origin of dorsal on snout; the rays of the last third of the dorsal and anal are the longest. Left pectoral a little less than head without snout; right one somewhat longer than eye. First ray of right ventral opposite to fourth of left side. Caudal rounded. All finrays are simple. Scales ctenoid on coloured side, cycloid on blind side. Unpaired fins scaly. Six to seven short rod-like gillrakers on lower limb of first arch. Colour of alcohol-specimens reddish brown, clouded with darker. Dorsal, anal and caudal with brown blotches. Length 113 mm.

Habitat: Madura strait, 94 M.!; Java-sea 54 M.!; South coast of Java!; Madura-sea, 100 M.!; Timor-sea 112 M.!.

9. **Bothus (Arnoglossus) tapeinosoma** (Blkr.).

Platophrys (Arnoglossus) tapeinosoma Bleeker, Ned. Tijdschr. Dierk. III. 1866, p. 49. — Atl. ichth. VI. 1866—1872, p. 13.

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1) By a misprint they are called "ctenoid" in the original description.

Arnoglossus macrolophus Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 280. — Ann. Mag. Nat. Hist. (6) VI. 1890, p. 433.
Arnoglossus macrolophus Johnstone, Pearl Oyster Rep. II. Fishes 1904, p. 211.
Arnoglossus macrolophus M. Weber, Siboga Exped. Fische 1913, p. 432.

D. 83—90; A. 65—70; P. sin. 10—13; P. dextr. 7—10; V. 6; L.l. 54—60.

Height 2.5—3.1, 2.9—3.7 in length with caudal. Head 3.3—4.2, 4—5.2 in length with caudal. Eye about 3, lower eye somewhat in advance of upper one and separated from it by a sharp elevated bony ridge. Snout somewhat shorter than eye. Mouth very oblique, not much curved, maxillary reaching to below anterior half of eye, 2.1—2.7 in head. Lower jaw prominent, with a rather feeble symphysial knob. Up to 6 of the anterior rays of dorsal filamentous in males, reaching well over the middle of the length. Origin of dorsal on blind side of snout, immediately above maxillary. Last rays of dorsal and anal very short, close to caudal. Left pectoral as long as head without snout in males, apparently somewhat shorter in females, right pectoral equal to postorbital part of head. First ray of right ventral opposite to fourth one of left side. Gill-rakers short. Scales ctenoid on coloured side, cycloid on blind side. Colour of alcohol specimens brownish. A dark spot on posterior dorsal and anal rays and near top of left pectoral. The filamentous dorsal rays of males often darkbrown. Body sometimes with dark blotches scattered along lateral line. Length up to 127 mm.

Habitat: Sumatra (Padang); Malacca strait!; Java-sea!; Saleyer 18—45 M.!; near Waigeu 141 M.! — Bay of Bengal off Ceylon, 45—63 M., China.

10. **Bothus (Arnoglossus) mogki** (Blkr.) [1]). [Fig. 30, p. 129].

Rhombus Mogkii Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 256.
Rhomboidichthys (Engyprosopon) mogkii Günther, Cat. Brit. Mus. IV. 1862, p. 438.
Pseudorhombus Mogkii Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 230.
Platophrys (Arnoglossus) mogki Bleeker, Atl. ichth. VI. 1866—1872, p. 14.
Engyprosopon Mogki M. Weber, Siboga-Expeditie, Fische, 1913, p. 429.

D. 78—84; A. 58—62; P. sin. 11—13; P. dextr. 7—9; V. 6; L.l. 52—55.

1) With *Achirus Mogki*, Nat. Tijdschr. Ned. Indië XXII. 1860, p. 101, named from Singapore, BLEEKER certainly meant this species, as there is no *Achirus* of that name.

Oval, upper profile of head evenly rounded. Height 2—2.1, 2.4—2.6 in length with caudal. Head 3.4—3.9, 4.2—4.7 in length with caudal. Eyes 3.5, separated by a scaly interspace which is 0.3—0.5 of eye. The lower eye is somewhat in advance of the upper one. Eye equal to snout. Mouth oblique, somewhat curved, maxillary not quite reaching to frontborder of eye, 2.6—2.9 in head. Pointed, somewhat curved teeth in one row in the lower jaw and in two rows in the upper jaw. Origin of dorsal beginning on blind side on snout, that of anal slightly before vertical through hindborder of operculum. Subposterior rays of dorsal and anal longest. All dorsal and anal rays simple, those of caudal forked. Left pectoral equal to head without snout, right one equal to eye and snout.

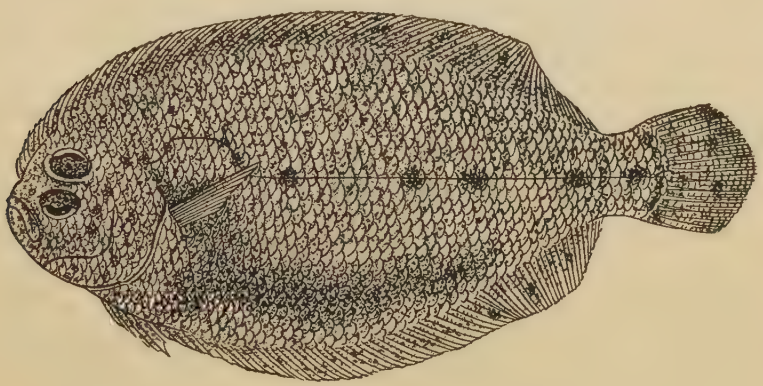

Fig. 30. *Bothus (Arnoglossus) mogki* (Blkr.) × 7/8.

First ray of right ventral opposite to fifth one of left side. Rays of left ventral not much larger than those of right one and about equal to eye and snout. Caudal bluntly pointed. Scales ctenoid on coloured side, cycloid on blind side. Six small rod-like gillrakers on lower branch of first arch. Colour of alcohol specimens dark brown, mottled on head, body and fins with blackish. Length 118 mm.

Habitat: Puluh Weh!; Singapore; Bali; Celebes (Menado, Tanawanko, Tombariri, Makassar, Badjoa); Ternate; Buru; Ambon; Ceram!.

11. Bothus (Arnoglossus) brevirictis (Alc.).

Arnoglossus brevirictis Alcock, Ann. Mag. Nat. Hist. (6) VI. 1890, p. 433.
Arnoglossus brevirictis M. Weber, Siboga Exp. Fische 1913, p. 432.

D. 76—80; A. 60—62; P. 10; V. 6; L.l. 55.

Height about 2.75 in length with caudal. Head 4.3 in length with caudal. Snout not quite $^2/_3$ of eye. Eye 3, separated by a very thin and sharp decliving ridge; the lower in advance of the upper. Mouth small. Maxillary barely reaching behind vertical through anterior border of eye, 3.5 in head. Pointed even teeth in a single row in both jaws. Dorsal beginning almost on the tip of the snout. Right pectoral equiradial with, but much narrower and shorter than the left, which is as long as the portion of the head behind the middle of the lower eye. Caudal obtusely rounded. Scales ctenoid on coloured side, cycloid on blind side. Gillrakers small, smooth. Colours in life (according to ALCOCK): left side dusky brown, with indefinite blackish patches round the body inside the vertical fins and along the lateral line, and with black speckles on all the fins. Length 70 mm.

Habitat: Celebes (Menado 55 M.!). — Off Ganjam Coast, British India 54 M.

12. **Bothus (Arnoglossus) intermedius** (Blkr.).

Platophrys (Arnoglossus) intermedius Bleeker, Ned. Tijdschr. Dierk. III. 1866, p. 47. — Atl. ichth. VI. 1866—1872, p. 14.
Engyprosopon intermedius Regan, Trans. Linn. Soc. London, XII. (3) 1908, p. 235.
Anticitharus annulatus M. Weber, Siboga-Exp. Fische 1913, p. 433.

D. 79—84; A. 55—60; P. sin. 1.11—12, P. dextr. 7—9; V. 6; L.l. 48—54.

Rather elongate; dorsal profile of head somewhat arched. Height 2—2.2, 2.5 to nearly 3 in length with caudal. Head 3.2—3.6, 3.8—4.2 in length with caudal. Eyes 3.2—4.5, separated by a space, which is about one third of eye and bears one row of scales, at least in its posterior part. Lower eye somewhat in advance of upper one. Snout less than or equal to eye. Mouth oblique, curved. Chin with a prominent knob. Maxillary reaching somewhat beyond frontborder of eye, 2.2—2.8 in head. One row of pointed, curved teeth in each jaw, those of lower jaw and the anterior ones of upper jaw larger and caninoid. Dorsal beginning on snout on blind side, anal slightly before vertical through hindborder of operculum. Subposterior rays of dorsal and anal the longest; sometimes the first dorsal ray is somewhat enlarged and as long as the longest subposterior rays (males?). Dorsal and anal rays simple, those

of caudal divided. Left pectoral as long as postorbital part of head or somewhat longer. In young specimens we find the pectorals longer, longer than head without snout and in some of lastnamed the second ray is filamentous and reaches to below posterior third of dorsal. Right ventral equal to snout and eye, in young specimens longer. First ray of right ventral opposite to fourth of left one, in young specimens opposite to third one. Caudal obtusely pointed. Colour of alcohol specimens brownish. Body and fins more or less variegated with darker. Length 127 mm.

Habitat: Java sea!; Saleyer 18—45 M.!; Celebes (Menado?); Tanah Djampea 32 M.!; Timor Sea!. — Indian Ocean.

Note: The seven specimens from Saleyer (Siboga Expedition) 51—82 mm. long, differ somewhat from the other, larger specimens, which we could examine. Their dorsal profile is more arched, the pectorals are longer, the left one even being produced in some of the specimens and the right ventral is more behind the left one. As we have no specimen of the same length as those of Saleyer, we cannot make out if they are the young of a new species or that the differences are due to age. Provisionally we unite them with *B. intermedius*.

13. **Bothus (Arnoglossus) poecilurus** (Blkr.). [Fig. 31, p. 132].

Rhombus poecilurus Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 293. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 29.
Pseudorhombus poecilurus Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 274. — Atl. ichth. VI. 1866—1872, p. 14.
Rhomboidichthys spilurus Günther, Challenger Rep. Zoology VI. 1880, p. 47.
Rhomboidichthys spiniceps Macleay, Proc. Linn. Soc. N.S. Wales VI. 1881, p. 127.
Platophrys spilurus Tate Regan, Fauna & Geography of the Maldive & Laccadive Archipelago I. prt. 3, 1902, p. 277.
Arnoglossus spilurus Johnstone, Pearl Oyster Rep. Ceylon II. Fishes 1904, p. 211.
Rhomboidichthys poecilurus Tate Regan, Journ. Bomb. Nat. Hist. Soc. XVII. 1905, p. 332.
Scaeops poecilura Jordan & Seale, Proc. U. S. Nat. Mus. XXVIII. 1905, p. 803.
Scaeops spilura Jordan & Seale, Bull. Bur. Fish. XXV. 1906, p. 412.
Scaeops poecilurus M. Weber, Siboga Exp. Fische 1913, p. 429.
Engyprosopon grandisquama McCulloch & Whitley, Records Austral. Museum XIV. 4. 1925, p. 343 (nec Schlegel).
Scaeops grandisquama McCulloch & Whitley, ibid.

D. 80—90; A. 59—68; P. sin. 9—11; dextr. 8—9; V. 6; L.l. about 40—48.

Upper profile strongly ascending in males, less so in females. Height 1.8, 2.1—2.2 in length with caudal. Head 3.5—3.8, 4.2—4.5 in length with caudal. Eye 2.5—4, the lower one — at least in males — in advance of the upper one. Interorbital space concave, scaly, equal to eye in males, half as long in females. A single or bifid spine on snout and a low one on interorbital rim in males. Snout much shorter than eye. Mouth small. Maxillary reaching to below anterior half of eye, equal to eye in length. Teeth in two rows in the upper jaw and in the posterior part of the lower jaw. Dorsal beginning at tip of snout. None of the rays enlarged; the last rays very small and close to caudal. Pectorals falcate, nearly as long as head in males, about equal to postorbital part of head in females. First ray of right ventral opposite to fourth one of left side.

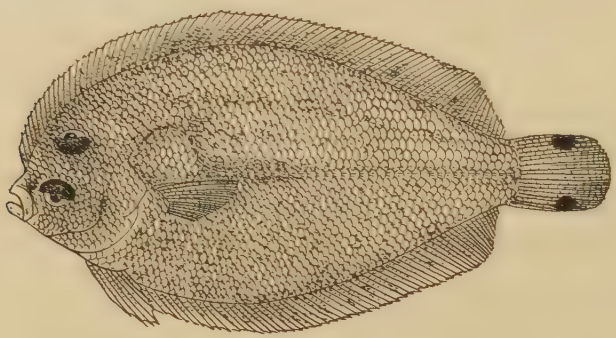

Fig. 31. *Bothus (Arnoglossus) poecilurus* (Blkr.) n.s.

Caudal rounded. Scales deciduous, ctenoid on coloured side, cycloid on blind side. Five short gillrakers on lower branch of first arch. Colour of alcohol specimens brownish, with a blackish spot at lower and upper margin of caudal. Sometimes a few more spots on caudal. Left pectoral occasionally banded with brownish. Length over 100 mm.

Habitat: Sumatra (Oleleh!); Banka; Java-sea (several localities!); Saleyer 18—45 M.!; Ambon; Sumbawa 36 M.!; West New Guinea 32 M.!; South of New Guinea!. — From Red Sea and Indian Ocean to Philippines and Queensland.

14. Bothus (Arnoglossus) aspilus (Blkr.).

Rhombus aspilos Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 408. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 14.

Arnoglossus aspilus Günther, Cat. Brit. Mus. IV. 1862, p. 417.
Platophrys (Arnoglossus) aspilus Bleeker, Atl. ichth. VI. 1866—1872, p. 15.

D. 80—84; A. 62—64; P. sin. 11—12; P. dextr. 9; V. 6; L.l. 46—48.

Oval, dorsal profile of head not strongly elevated, regularly sloping down, with a more or less conspicuous notch on snout. Height 2.3—2.5, about 3 in length with caudal. Head 3.9, 4.7—4.9 in length with caudal. Eyes 3.1 to nearly 4 in head, separated by a narrow interspace, which has one row of very small almost rudimentary scales, not always conspicuous. Lower eye slightly in advance of upper one. Snout shorter than eye. Maxillary not reaching below middle of eye, 2.1—2.4 in head. Mouth oblique, somewhat curved. A single row of pointed teeth in both jaws. Dorsal beginning on snout on blind side, anal beginning about on vertical through hindborder of operculum. Subposterior rays of dorsal and anal longest. Dorsal and anal rays simple, those of caudal forked. Right pectoral less than, left pectoral equal to or more than, postorbital part of head. First ray of right ventral opposite to fourth one of left side, their longest rays subequal and about equal to postorbital part of head. Scales ctenoid on left side, cycloid on blind side, rather deciduous. Seven slender gillrakers, not quite half diameter of eye, on lower branch of first arch. Colour of alcohol specimens uniform brownish. Length 82 mm.

Nom. indig.: Mata Sablah (Malay Batavia).

Habitat: Singapore; Pulu Weh!; Malacca Strait!; Sumatra (Padang); Banka Strait!; Java sea!; Java (Batavia, Cheribon!); Madura!; Bali; Celebes (Makassar 30 M.!); Ambon!; Lirung (Salibabu 36 M.!); Arafura Sea 32 M.

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3. Fam. Pleuronectidae.

Eyes on the right side. Dorsal beginning on head; without spines. Ventrals either short-based and symmetrical, or long based and asymmetrical. Pectorals present or the left one wanting. Mouth terminal, small or large. Lower jaw somewhat prominent. Teeth in jaws often more developed on blind side than on coloured side. Vomer sometimes toothed. Pectoral radials present. Olfactory organ with the laminae slightly raised, parallel, without rhachis. Lateral line straight or with a curve anteriorly.

Key to the indo-australian Genera of Pleuronectidae.

I. Dorsal beginning above the eye. Pectoral of left side well developed. Ventrals short-based, symmetrical or nearly so.
  a. Eyes with tentacles . . . . . *Nematops* p. 134.
  b. Eyes without tentacles . . . . . *Poecilopsetta* p. 136.

II. Dorsal beginning before eyes. Left pectoral present or absent. Ventrals rather long-based, asymmetrically placed.
  A. Mouth small. Left pectoral wanting. Lateral line straight.
    a. Dorsal and right ventral with produced rays. Caudal rays simple . . . . . *Samaris* p. 138.
    b. Dorsal and right ventral rays not greatly produced. Caudal rays forked . . . . . *Samariscus* p. 140.
  B. Mouth large. Left pectoral present. Lateral line with a curve above pectoral.
    a. Scales firm, covering upper surface of eyes, jaws and snout. . . . . *Lepidoblepharon* p. 142.
    b. Scales deciduous, not covering surface of eyes, jaws or snout. Vomer toothed . . . . . *Brachypleura* p. 144.

1. Nematops Günther.

(Günther, Challenger Rep. Zoology, vol. I. Part VI. 1880, p. 57).
Limanda p. p. Goode & Bean, Ocean. Ichthyology 1895, p. 427.

Eyes on the right side, close together, the upper encroaching upon the upper profile. Each eye provided with a tentacle. Mouth small. Teeth small, scarcely any teeth on coloured side. No teeth on palate. Dorsal beginning above the eye. Pectorals equally developed. Ventrals opposite or nearly so. Scales moderate, ctenoid on coloured side, cycloid on blind side. Lateral line with a curve anteriorly.

Distribution: Two species are known, one from Admirality Islands, the other from Bali.

1. **Nematops grandisquama** n. sp. [Fig. 32, p. 135].

D. 52—59; A. 45—48; P. dextr. 7—9; P. sin. 6—7; V. 6; L.l. ±50; Sq. l. 44—48.

Rather elongate, dorsal profile sloping in an even curve to

snout, the profile only interrupted by the upper eye. Height 2.2—2.4, 2.8—2.9 in length with caudal. Head 3.7—4, 4.5—4.7 in length with caudal. Eyes 2.2—2.3, situated above each other, the upper one encroaching upon the upper profile. Tentacles of eyes nearly as long as eye, situated on posterior part of eyelid. Eyes very close together, the interspace not elevated. Snout equal to half eye. Mouth small, oblique. Maxillary scarcely reaching behind frontborder of eye, 2.8 in head. Teeth small, pointed and recurved, in a single row on left rami of jaws, in two rows at symphysis, not extending on right side. Dorsal beginning above middle of eye, ending close to caudal; its rays simple, subequal, as long as eye. Anal

Fig. 32. *Nematops grandisquama* n. sp. × 5/4.

beginning one eyediameter behind origin of pectorals, ending below end of dorsal, its rays simple, subequal, somewhat longer than those of dorsal. Pectorals of equal length, equal to eye and snout and to right ventral, which is situated somewhat in advance of and is longer than left ventral. Caudal obtusely pointed. Scales deciduous, ctenoid on right side, cycloid on blind side. About twelve slender falcate gillrakers on lower branch of first arch, the longest 1/3 of eye. Colour of alcohol specimens brownish red, on right side with irregular black blotches along base of dorsal and anal, one of them below beginning of last third of dorsal and a corresponding one above anal, more distinct than the others. Fins with dark markings. Tip of pectoral blackish. Caudal with large transverse black blotches on its hinderhalf. Tentacles on eye blackish. Length 87 mm.

Habitat: 5 specimens, caught by the Fishery-Investigation Steamer „Gier" from 108—162 M. in St. Nikolaas-bay, Bali!.

Note. Distinguished from *N. microstoma* Gthr. by its larger scales.

2. Poecilopsetta Günther.

(Günther, Challenger Rep. Zoology I. Part VI. 1880, p. 48).
Boopsetta Alcock, Journ. Asiat. Soc. Bengal, LXV, part II. 1896, p. 305.

Eyes on the right side, close together or separated by a flat, scaly interorbital space. Mouth rather small. Teeth in bands in jaws, none on palate. Dorsal beginning above the eye. Pectorals equally developed, ventrals opposite or nearly so.

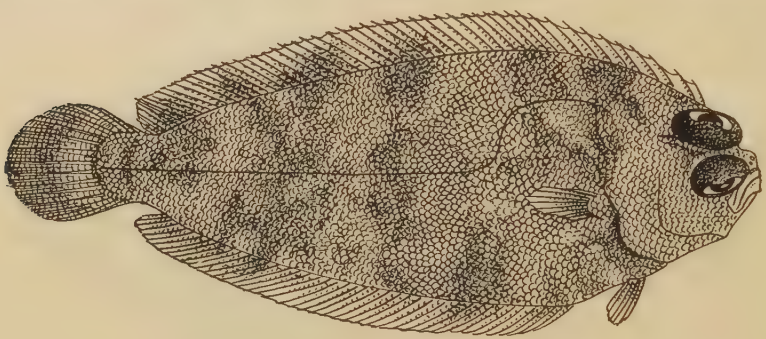

Fig. 33. *Poecilopsetta maculosa* Alc. $\times 3/4$.

Scales small, feebly ctenoid on coloured side, cycloid on blind side. Lateral line with a curve anteriorly. Gillmembranes united below the throat.

Distribution: From Bay of Bengal and Ceylon through indo-australian Archipelago to Japan and Hawaiian Islands, in depths till 731 M.

Key to the indo-australian species of Poecilopsetta.

1. Eyes separated by a narrow flat space, which is scaly . *P. colorata* p. 136.
2. Eyes almost touching each other. . . . . *P. maculosa* p. 137.

1. Poecilopsetta colorata Gthr.

Poecilopsetta colorata Günther, Challenger Rep. Zool. I. part VI. 1880, p. 48.

D. 61; A. 50; P. dextr. 12; P. sin. 9; V. 6; L.l. about 100.

Height 2.2, 2.7 in length with caudal. Head 3.6, 4.5 in length with caudal. Eyes large, 2.6, opposite to each other, sepa-

rated by a narrow flat space, which has about 4 rows of scales. Snout very short, with the jaws equal in front. Cleft of the mouth obliquely ascending upwards, the maxillary reaching beyond the anterior margin of the eye. Maxillary equal to eye. The dorsal fin commences above the middle of the eye, and is continued to within a short distance of the caudal. None of its rays elongate. Pectoral of right side equal to postorbital part of head, left one as long as snout and eye. Ventrals separate, opposite to each other, equal to eye. Scales feebly ctenoid on coloured side, cycloid on blind side. Caudal and right pectoral scaled. Left pectoral only scaled at base. Colour light brownish; head and body with numerous black dots; dorsal and anal blackish; caudal with a large spot near its upper and lower margins; pectoral with a large black spot occupying nearly the whole fin. Length 150 mm. [Type in British Museum seen by us].

Habitat: Kei-islands 232 M.!

2. **Poecilopsetta maculosa** Alc. [Fig. 33, p. 136].

Poecilopsetta maculosa Alcock, Journ. Asiat. Soc. Bengal LXIII. part II. N°. 2, 1894, p. 130.
Poecilopsetta praelonga Alcock, l.c. p. 130.
Boopsetta umbrarum Alcock, ibid. LXV. part II. N°. 3, 1896, p. 305.
Poecilopsetta praelonga Alcock, Ann. Mag. Nat. Hist. (7) II. 1898, p. 156.
Boopsetta praelonga Alcock, Descr. Cat. Deep-sea fishes, India, Calcutta 1899, p. 126.
Boopsetta maculosa Alcock, l.c. p. 127.
Boopsetta praelonga Brauer, Deutsche Tiefsee-Exp. Tiefseefische 1906, p. 295.
Boopsetta maculosa M. Weber, Siboga Exp. Fische 1913, p. 434.

D. 56—65; A. 44—54; P. dextr. 10; P. sin. 9; V. 6; L.l. 80—100.

Rather elongate. Height 2.3—2.7, 3—3.1 in length with caudal. Head 3.8—4, 4.7—4.9 in length with caudal. Eyes large, 2.5—2.7, above each other or the inferior one more forward than the upper one, almost touching each other. Snout very short, about half diameter of eye. Mouth small, curved, strongly ascending. Maxillary equal to eye, not reaching quite to below middle of eye. Palate toothless. Jaws with bands of small pointed teeth. Dorsal beginning below posterior half of upper eye, ending close to caudal. All rays simple. Anal beginning below middle of pectoral, ending below end of dorsal. Pectoral of left side equal to eye and snout, that of right side somewhat shorter. Ventral of right side equal to pectoral of left side,

ventral of left side equal to pectoral of right side. Caudal obtusely pointed. Lateral line only present on right side, abruptly ascending from gillopening, then running horizontally for about 12 scales or more, which part is separated by about 11 scales from dorsal profile and then again descending in an almost vertical direction to middle of side, from where it runs straight to caudal. Both sides of body and head covered by scales, excepting the snout and the maxillaries. They are ctenoid on the coloured side, in one specimen cycloid, in the others more or less distinctly ctenoid on the cheeks, cycloid on the blind side. About 10 slender gillrakers on first branchial arch. Colour of alcohol specimens lighter or darker brownish on right side with darker cloudy patches, not always distinct. The left side is light, marked with rows of dark spots in one specimen. Fins dusky or with black margins. Tip of right pectoral blackish. Length more than 160 mm.

Habitat: North-west off Sumatra 296—362 M.; North of Bali 230—250 M.!; Timor sea 216 M.!; Kei-islands 310 M.! — Bay of Bengal, Andaman Sea, Indic 260—700 M.

3. Samaris Gray.

(Gray, Zoological Miscellany 1831, p. 4).

Eyes on the right side, close together. Mouth narrow. Teeth small, equal, in narrow bands in the jaws, none on the palate. Dorsal beginning on the snout, the first rays produced. Only the right pectoral developed. Right ventral with produced rays much longer than and somewhat in advance of left one. Dorsal-, anal- and caudal rays simple. Scales strongly ctenoid on coloured side, cycloid or moderately ctenoid on blind side. Lateral line straight, without curve above pectoral. Gillrakers rudimentary. Gillmembranes broadly united below the throat.

Distribution: That of the single species known.

1. Samaris cristatus Gray. [Fig. 34, p. 139].

Samaris cristatus Gray, Zool. Miscellany 1831, p. 4.
Samaris cristatus Günther, Cat. Brit. Mus. IV. 1862, p. 420.
Samaris cristatus Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 291.

D. 73—81; A. 51—57; P. dextr. 4; P. sin. 0; V. dextr. 5; V. sin. 5; L.l. 68—77.

Rather elongate, upper profile of head much elevated, with a more or less distinct notch before eyes. Height 2.2—2.9,

2.8—3.5 in length with caudal. Head 4.4—4.7, 5.6—6.8 (in specimen with prolonged caudal) in length with caudal. Eyes subequal, 3.1—3.7, situated above each other or the upper one slightly in advance of the lower one, separated by a keeled ridge. Snout equal to $^5/_7$ of eye. Mouth small, very oblique, lower jaw slightly prominent. Maxillary 2.5—2.8 in head. Several rows of minute pointed teeth in the jaws, none on the palate. The first 11—14 rays of the dorsal are filamentous,

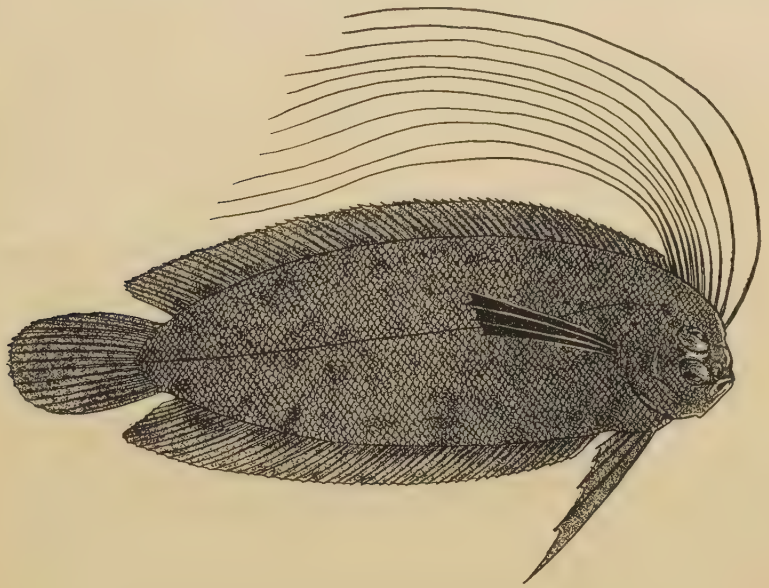

Fig. 34. *Samaris cristatus* Gray $\times$ $^4/_5$.

with a stiff base, and as long as the trunk. The first one originates before the upper eye, but the dorsal is continued in front of it as a fold of the skin, running on the blind side across the head to the chin. Dorsal ending at some distance from caudal. Origin of anal one eye-diameter behind origin of pectoral, ending below end of dorsal. Right pectoral one eye-diameter longer than head, left pectoral wanting. Right ventral much longer than and somewhat in advance of left one, longer than pectoral. The rays of the right ventral are produced and spatulate at the end. Caudal obtusely pointed. Linea lateralis straight. Scales ctenoid on both sides, but the fine denticules soon wear off at the blind side, where the scales appear

therefore as cycloid, although generally some ctenoid scales can be detected. About 10 minute gillrakers on lower branch of first arch. Colour of alcohol specimens brownish red, with darker blotches, scattered over the body. Fins freckled with whitish and dark spots. Pectoral darkbrown. Tip of caudal often dark brown. Length 150 mm.

Habitat: Singapore; Java sea!; Strait Bali 20—65 M.! — Chinese seas, Bay of Bengal, off south and east coast of Ceylon.

4. **Samariscus** Gilbert.

(GILBERT, Bull. U. S. Fish Comm. XXIII (1903), Part 2, 1905, p. 682).

Eyes on the right side, close together or separated by a narrow scaly interspace. Mouth narrow. Teeth small, in bands in the jaws. None on the palate. Dorsal beginning on the snout, none of the rays greatly produced, although they may

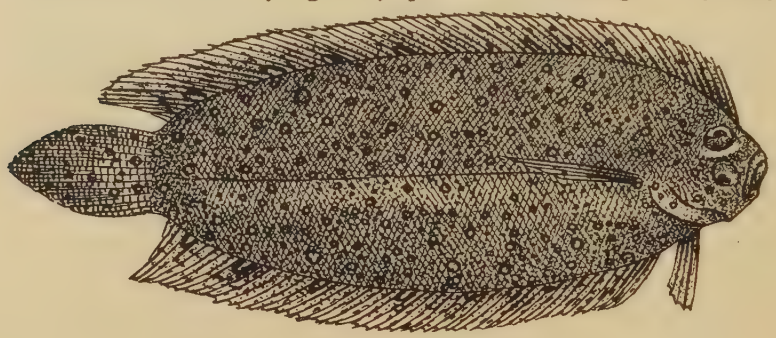

Fig. 35. *Samariscus huysmani* M. Web. n. s.

be somewhat longer and more distantly placed than the following. Only the right pectoral developed. Right ventral longer than left one, without produced rays. Dorsal and anal rays simple, caudal rays forked. Scales ctenoid on both sides. Lateral line straight, without abrupt curve above pectoral. Gillrakers rudimentary. Gillmembranes broadly united below throat.

Distribution: Gulf of Aden, Indo-australian Archipelago, Hawaiian Islands. Up to 252 M. depth.

Key to the indo-australian species of Samariscus.

I. Pectoral produced, half as long as length without caudal. *S. sunieri* p. 141.

II. Pectoral shorter or slightly longer than head.

1. Head 3.7. L. l. 70 . . . . . *S. maculatus* p. 141.

2. Head 4.7. L.l. 74. . . . . *S. huysmani* p. 142.

1. Samariscus sunieri n. sp.

D. 70—76; A. 54—61; P. dextr. 5; V. dextr. 5, sin. 5; L. l. 68—74.

Rather elongate, upper profile of head not much convex. Height 2.9—3.4, 3.5—4.3 in length with caudal. Head 4—4.7, 5—6.1 in length with caudal. Eyes 2.7—3.1, separated by a somewhat elevated interspace, which has two rows of scales. Lower eye larger and somewhat in advance of upper one. Snout less than eye. Mouth rather oblique, small. Maxillary not quite reaching below middle of eye, 2.2—2.4 in head. Jaws with a band of minute teeth. Palate edentulous. Origin of dorsal somewhat before frontborder of upper eye; none of the rays enlarged, ending close to caudal. Origin of anal slightly behind that of pectoral, ending below end of dorsal. Pectoral very long, half as long as length without caudal. Right ventral beginning somewhat behind vertical through hindborder of eye, as long as head without snout; left one much shorter. Scales ctenoid on both sides. Caudal rounded. Gillrakers short or rudimentary, knoblike. Colour of alcohol specimens dark brownish, with 5 dark blotches or incomplete rings along base of dorsal and 4 similar ones along base of anal. Body and fins variegated with dark spots. Vertical fins with a dark border. Pectoral regularly ringed gray and black. Length 136 mm.

Habitat: 13 specimens from Nikolaas bay Bali 108—162 M.!; one specimen north of Bali 234—252 M.!. All collected by Fishery-Investigation steamer „Gier". Named in honour of Dr. A. L. J. SUNIER.

2. Samariscus maculatus (Gthr.).

Samaris maculatus Günther, Challenger Rep. Zoology, vol. I. Part VI. Shore Fishes, 1880, p. 47 and vol. XXII. Deep-Sea Fishes 1887, p. 162.

D. 73; A. 57; P. dextr. 5; L. l. 70.

Height 3, 3.6 in length with caudal. Head 3.7, 4.3 in length with caudal. Eyes 3.8, very close together, the lower somewhat in advance of the upper. Snout scarcely shorter than eye. None of the dorsal rays prolonged, but the anterior are much more distant from each other than the succeeding. Right pectoral with narrow base, elongate, but shorter than head. Light coloured, with a series of five distant black spots along the dorsal profile; a similar series along the anal profile, and a third, composed of three spots along the lateral line. Vertical

fins with irregular blackish dots and blackish margins. Pectoral variegated with black. Length 100 mm. [Type in British Museum seen by us].

Habitat: Kei-islands 252 M.! — Indian Ocean.

3. **Samariscus huysmani** M. Web. [Fig. 35, p. 140].

Samariscus Huysmani M. Weber, Siboga-Exp. Fische 1913, p. 420.

D. 68—70; A. 55—57; P. dextr. 5; V. dextr. et sin. 5; L. l. 74; L. tr. 46.

Rather elongate, upper profile of head not much convex. Height 2.8, 3.3 in length with caudal. Head 4.7, 6 in length with caudal. Eyes 4, separated by a somewhat elevated interspace, which has two rows of scales. Lower eye slightly in advance of upper one. Snout equal to eye. Mouth very oblique, small. Maxillary not reaching to below middle of eye, 2 in head. Jaws with a band of minute teeth. Palate edentulous. Origin of dorsal somewhat before frontborder of upper eye; none of the rays enlarged, ending close to caudal. Origin of anal slightly behind that of pectoral, ending below end of dorsal. Pectoral almost one eye-diameter longer than head. Right ventral as long as head without snout, beginning somewhat behind vertical through hindborder of eye, left one much shorter. Caudal rounded. Scales ctenoid on both sides. Gillrakers few in number, short and of unequal size. Colour of alcohol specimen light brownish, with 5 ocelli along base of dorsal and 4 along that of anal; besides there are smaller spots or rings on head and body. Fins with similar spots. Pectoral dark brown. Blind side colourless. Length of single specimen known 100 mm. [Type in the Amsterdam Museum examined by us].

Habitat: Java-sea!.

5. **Lepidoblepharon** M. Weber.

(M. Weber, Siboga-Exp. Fische 1913, p. 421).

Eyes on the right side, separated by a narrow scaly space. Mouth wide. Teeth small, in bands in the jaws. Head of vomer projecting into the mouth, toothless or perhaps with a few teeth at its posterior border. Palate for the rest toothless. Dorsal beginning near tip of snout. No enlarged dorsal rays. Rays of caudal forked, those of dorsal and anal either simple or split at their top, the hindermost of the anal are more

distinctly forked. Base of right ventral well in advance of that of left one. Both pectorals developed. Scales firm, ctenoid on coloured side, where they also cover the jaws, the snout and the upper surface of the eyes. Cycloid on blind side. Lateral

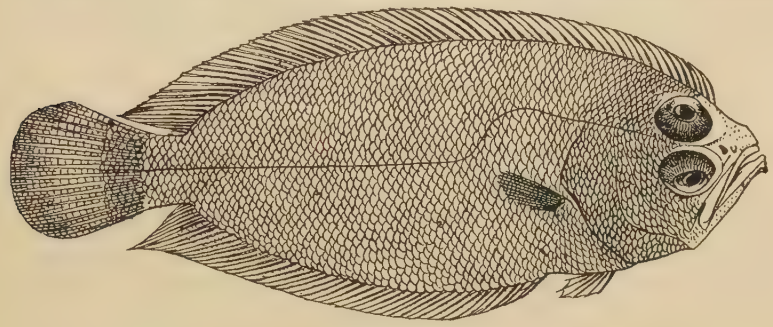

Fig. 36. *Lepidoblepharon ophthalmolepis* M. Web. $\times$ 4/5.

line with a curve above pectoral. Gillrakers long. Gillmembranes united below throat.

Distribution: That of the single species known.

1. Lepidoblepharon ophthalmolepis M. Web.

Lepidoblepharon ophthalmolepis M. Weber, Siboga-Exp. Fische 1913, p. 422.

B. 6; D. 62; A. 46; P. dextr. 11; P. sin. 12; V. dextr. & sin. 6; C. 19; L. l. 56.

Height 2.4, almost 3 in length with caudal. Head 3.1, 3.7 in length with caudal. Eyes 3.2 in head, opposite to each other, separated by a rather narrow, convex scaly space. Maxillary twice in head, oblique, reaching to below middle of eye, its anterior part is almost horizontal and the lower jaw is consequently bent forward and has a sharp knob at symphysis. The fine teeth in the jaws form bands, which are broader anteriorly. Origin of dorsal on snout. Base of dorsal and anal in a low sheath, their rays increasing in height posteriorly. Caudal rounded. Right pectoral about 5/6 of head, left one longer. The ventrals are short, they are situated about midway between isthmus and anus; the base of the left one is shorter than the right one. Scales ctenoid on coloured side, cycloid on blind side. They cover the rays of dorsal, anal, caudal as well as the upper ray of the pectoral and also lower jaw, maxillary, snout and the entire upper surface of the eyes, where they are crowded. 13 rod-like finely dentated gillrakers,

as long as half eye, on lower branch of first arch. Colour in alcohol brownish with a darker brown band below base of dorsal and above that of anal. Blind side lighter. Length of single specimen known 122 mm.

Habitat: Arafura-sea near Kei islands, 310 M.!

6. **Brachypleura** Günther.

(Günther, Cat. Brit. Mus. IV. 1862, p. 419).
Laiopteryx M. Weber, Siboga-Exp. Fische, 1913, p. 422.

Eyes on the right side, separated by a bony keel. Mouth wide. Teeth in two rows in both jaws [1]), the outer row consisting of stronger teeth, which are curved or hastate and caninoid in the anterior part of the jaws. Head of vomer projecting into the mouth, with a patch of conical teeth. Dorsal beginning on snout, before eyes. Anterior dorsal rays filamentous in males. Only the right pectoral developed. Base of right

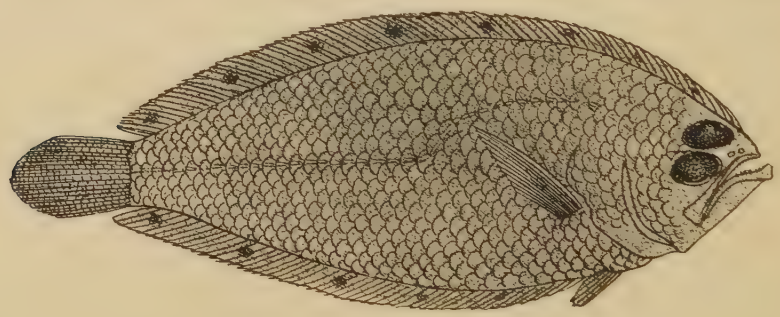

Fig. 37. *Brachypleura novae-zeelandiae* Gthr. n.s.

ventral well in advance but smaller than left one. Both pectorals developed. Dorsal and anal rays simple, those of caudal forked. Scales deciduous, ctenoid on coloured side, cycloid or with a few denticulations only on blind side. Lateral line with a curve above pectorals. Gillrakers few but well developed. Gill-membranes more or less united below throat.

Distribution: For distribution see that of the only species known.

1) Günther says: „those of the lower jaw in a single series." This is not true, as there are two rows in the type specimen in the British Museum. (Communication of Mr. Norman). The lateral line is also curved, and not „without curve" as Günther states. In consequence of these mistakes in Günther's diagnosis one of us founded the genus *Laiopteryx*, which is a synonym of *Brachypleura*.

1. **Brachypleura novae-zeelandiae** Gthr. [Fig. 37, p. 144].

Brachypleura novae zeelandiae Günther, Cat. Brit. Mus. IV. 1862, p. 419.
Brachypleura xanthosticta Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 281; ibid. LXV. 1896, p. 327.
Laiopteryx xanthosticta M. Weber, Siboga-Exp. Fische, 1913, p. 423.

D. 65—72; A. 41—47; P. dextr. sin. 12; V. 3.2.1; L.l. 32—33.

Elongate. Height 2.3—2.7, 2.7—3.1 in length with caudal. Head 3—3.3, 3.3—3.8 in length with caudal. Eyes somewhat more or less than 3, the posterior border of upper one, which is the larger in the vertical through middle of inferior one, separated by a bony keeled ridge. Snout about equal to eye. Maxillary about 1.5 in head, almost reaching to below hind-border of eye. Cleft of mouth strongly ascending, its anterior part horizontal and with a gentle curve, the praemaxillaries being convex and fitting in a concavity of the lower jaw, which has a prominent symphysial knob. Jaws with an outer row of pointed, curved, often hastate teeth and an inner row of smaller ones, which are however as large as the outer ones near symphysis. Head of vomer projecting into the mouth cavity and covered by small pointed teeth. Nostrils close together, below anterior part of superior eye, the upper one a longitudinal slit, the lower one rounded; both close to point of snout on blind side. Origin of dorsal beginning on blind side immediately behind point of snout below nostrils. The 3rd—6th ray long and filamentous, half as long as length without caudal in males. Anal beginning behind vertical through origin of pectoral, the posterior rays somewhat longer than the anterior ones. Caudal bluntly pointed (?). Scales deciduous, only absent on snout of coloured side, where they are finely ctenoid; cycloid or with some fine denticulations only on blind side. No scales on fins. Top of curve of lateral line separated by two scales from dorsal. Right pectoral as long as head without snout, left one somewhat shorter. Right ventral slightly less than snout and eye, left one longer. Seven to eight slender gillrakers on lower branch of first arch, finely dentated behind. Colour of alcohol specimens yellowish or brownish. Length over 100 mm.

Nom. indig.: Grobag (javan.).

Habitat: Several localities in Java-sea 52—68 M.!, Java (Pemalang!); Madura strait!; Saleyer 18—45 M.!; Timor sea

36—73 M.!; Arafura Sea 63—88 M.; Coast of New Guinea 54 M. — Indian Ocean, New Zealand.

4. Fam. Soleidae.

Eyes on right or on left side, according to the genera. No spiny finrays. Ventrals either symmetrical or asymmetrical, free from anal or one of them connected with this fin; sometimes only one ventral is developed. Caudal free or confluent with dorsal and anal. Mouth small, terminal, subterminal or inferior, strongly asymmetrical; lower jaw not prominent. The snout is often produced above the mouth into a tapering point, which is turned downwards, overhanging the mouth and forming a hook. Minute teeth in jaws on blind side, on eyed side the teeth are feebly developed or absent. Olfactory organs symmetrical in position; their laminae arranged transversely to or radiating from a central rhachis. Lateral line, when present, straight. Sometimes two or three lateral lines are developed. No pectoral radials.

Key to the indo-australian genera of Soleidae.

I. Eyes on the right side.

A. Caudal free from dorsal and anal.

1. Pectorals present on both sides . . . . . *Solea* p. 147.
2. Pectorals wanting.

a. Ventrals free from anal.

α. One lateral line on each side. Ventrals short-based, symmetrical or nearly so . . . . . *Aseraggodes* p. 151.

β. One lateral line on each side, besides a second one on blind side along upper profile of neck. Right ventral with longer base than left one. . . . . *Liachirus* p. 158.

b. Right ventral with a long base, connected to anal.

α. One lateral line on each side . . . . . *Achirus* p. 159.

β. One lateral line on each side, besides a second one on blind side along the upper profile of neck. . . . . *Pardachirus* p. 164.

B. Caudal confluent with dorsal and anal.

1. Pectorals present, well developed or rudimentary. *Synaptura* p. 166.
2. Pectorals totally wanting . . . . . *Achiroides* p. 179.

II. Eyes on the left side, caudal confluent with dorsal and anal. Pectorals absent. Only the left ventral is developed.
A. Ventral connected with anal. Two or three lateral lines on coloured side.
1. Lips fringed . . . . . *Paraplagusia* p. 181.
2. Lips not fringed . . . . . *Cynoglossus* p. 185.
B. Ventral free from anal. No lateral line . . . . . *Symphurus* p. 208.

1. Solea Cuvier.

(Cuvier, Règne Animal, II. 1817. p. 223 [1]).

Scales ctenoid on both sides. One straight lateral line. Eyes on right side. Nostrils of blind side not dilated. Mouth curved, asymmetrical. Scales of left side of head often partially transformed into fringed, cutaneous flaps. Minute teeth in left jaws, in right jaws absent or at least poorly developed. Dorsal beginning on snout. Dorsal and anal separated from caudal. Dorsal and anal rays simple or divided, those of caudal allways divided. Pectorals present on both sides. Ventrals symmetrical or nearly so, not united with anal. Gillmembranes confluent, free from isthmus.

Distribution: East Atlantic, Indic and Pacific.

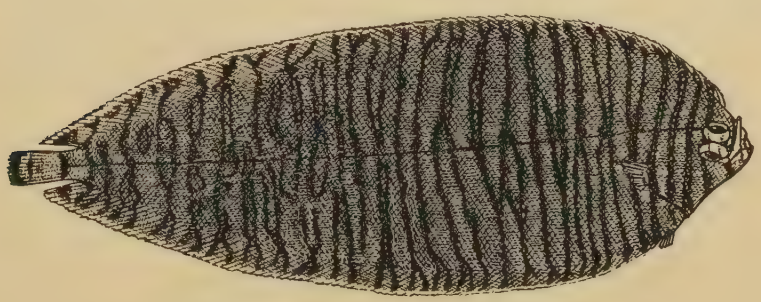

Fig. 38. *Solea heterorhina* Blkr. × 4/5.

Key to the indo-australian species.

1. D. 88—98; A. 80—87. Transverse wavy lines on head and body . . . . . *S. heterorhina* p. 148.
2. D. 55—62. A. 42—47. No transverse lines, but more or less distinct blackish blotches on body . . . . . *S. humilis* p. 148.

Doubtful species . . . . . { *S. trichodactylus* p. 150. / *S. irrorata* p. 150.

1) As defined by us, *Solea* corresponds with the subgenus *Solea* of Günther.

1. Solea heterorhina Blkr. [Fig. 38, p. 147].

Solea heterorhinos Bleeker, Act. Soc. Sc. Indo Neerl. I. 1856, Visschen Ambon, p. 64.
Soleichthys heterorhinos Bleeker, Act. Soc. Sc. Indo Neerl. VIII. 1860, Dertiende Bijdr. Celebes, p. 14.
Solea heterorhina Günther, Cat. Brit. Mus. IV. 1862, p. 466.
Solea heterorhina var. Kner, Denkschr. Akad. Wiss. math. naturw. Cl. XXIV. (1864) 1865, p. 8.
Solea heterorhina Bleeker, Atl. ichth. VI. 1866—1872, p. 17.
Solea nigrostriolata Steindachner & Kner, Sitzber. Akad. Wien LXI. 1870, p. 427.
Solea heterorhina Day, Fishes of India 4°. 1878—1888, p. 426.
Solea lineata Ramsay, Proc. Linn. Soc. N. S. Wales VII. 1883, p. 406.
Soleichthys heterorhinos Evermann & Seale, Bull. Bur. Fish. XXVI. 1906, p. 107.
Solea heterorhina Günther, Fische der Südsee, Heft VIII. 1909, p. 345.
Solea heterorhina M. Weber, Siboga-Exp. Fische 1913, p. 435.
Soleichthys heterorhinos McCulloch, Mem. Queensl. Mus. V. 1916, p. 60.
Soleichthys heterorhinos Norman, Biol. Res. „Endeavour" V. 1926, p. 286.

D. 88—98; A. 80—87; P. dextr. 9, sin. 8; V. 4; L.l. 110—120.

Elongate. Height 2.7—2.9, 3—3.1 in length with caudal. Head 5.8—6.2, 6.7—7 in length with caudal. Eyes 3.4—3.6, contiguous, the upper eye in advance of the lower one. Nostrils close together, covered by one cutaneous flap, which is elongated and longer than eye on coloured side. Snout shorter than or equal to eye. Mouth small, curved, reaching to frontborder of lower eye. Teeth villiform, in bands in both jaws, more developed on blind side. Origin of dorsal above frontborder of upper eye. Dorsal and anal ending close to caudal. Right pectoral with a broad base, the upper ray as long as snout and eye, the following one somewhat shorter, the other rays rudimentary. Left pectoral broad-based, connected with branchiostegal membrane, its rays rudimentary. Longest rays of ventral longer than eye. Colour of alcohol specimens yellowish or brownish, with pairs of dark transverse wavy lines, from snout to caudal and continued on vertical fins, which are often bordered with black or have a submarginal black band. Length 140 mm.

Habitat: Celebes (Menado); Ambon; Timor; Kei-islands!; Batjan; Waigeu; Schouten islands (Mysore). — Andamans, Philippines, Torres straits, New South Wales to Fiji islands and Samoa. — In sea.

2. Solea humilis Cant.

Solea humilis Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1201.
Solea ovata Cantor, l. c. p. 1202.

Solea maculata Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 409. — Verh. Bat. Gen. XXIV. 1852, Pleuronectid. p. 17 (nec CUVIER).
Solea humilis Günther, Cat. Brit. Mus. IV. 1862, p. 471.
? *Solea ovata* Günther, ibid. p. 472.
Solea humilis Kner, Novara Exp. Fische I. 1865—1867, p. 288.
Solea humilis Bleeker, Atl. ichth. VI. 1866—1872, p. 17.
Solea ovata Day, Fishes of India 4°, 1878—1888, p. 426.
Microbuglossus humilis Jordan & Seale, Bull. Bureau Fish. Washington XXVI. (1906), 1907, p. 46.
Microbuglossus humilis Seale, Philippine Journ. Sc. V. N°. 4, 1910, p. 287.

D. 55—62; A. 42—47; P. dextr. 7—8, P. sin. 4—5; V. 5; L.l. 100—110.

Oval. Profile of head much arched. Height 1.5—2.2, 2.2—2.6 in length with caudal. Head 3.6—4.1, 4.4—4.9 in length with caudal. Eye 4—5, the upper one well in advance of the lower one, the frontborder of which is one eye-diameter behind tip of snout. Interorbital space concave, scaly, less than one eye-diameter. Mouth contorted, reaching below anterior half of eye. Posterior nostril of right side with a low rim almost touching frontborder of lower eye, anterior one with a fleshy tentacle. Nostrils of blind side with a low rim, not very conspicuous as the snout of blind side is provided with series of short fleshy tentacles, corresponding to the rows of scales; teeth minute in elongate patches on jaws of blind side. Dorsal beginning above anterior nostril, ending very close to caudal, slightly behind end of anal. Pectoral of right side equal to postorbital part of head or somewhat longer, that of blind side shorter than snout and eye. Ventrals slightly shorter than left pectoral. Scales finely ctenoid on both sides; the denticles often worn, but the scales remain rough on touch. All fins scaly. Gillopenings narrow, gillmembranes united to isthmus. Gillrakers knob-like. Colour of alcohol specimens reddish brown on coloured side, with more or less distinct blackish blotches, especially along base of dorsal and anal fin. Vertical fins with similar but smaller spots. Greater part of right pectoral blackish. Blind side colourless. Length 89 mm.

Nom. indig.: Lida, mata-sablah (Malay Batavia).

Habitat: Bintang; Java-sea!; Java (Batavia!, Bantam, Udjung kulon, Surabaya!); Borneo (Sandakan). — From Madras to China, Philippines [1]).

1) According to MC CULLOCH, Checklist N. S. Wales, Prt. II. 1919, p. 37, erroneously recorded from SIDNEY by KNER.

Doubtful species.

1. Solea trichodactylus (L.).

Pleuronectes N°. 7, Artedi, Gen. Pisc. 1792, p. 111.
Pleuronectes trichodactylus Linné, Syst. Naturae ed. 13a, t. III. p. 1226.
Solea trichodactylus Kaup, Arch. Naturgesch. XXIV. 1, 1858, p. 95.
Solea trichodactylus Günther, Cat. Brit. Mus. IV. 1862, p. 472.
Solea trichodactylus Bleeker, Atl. ichth. VI. 1866—1872, p. 17.
Monochirus trichodactylus Jouan, Mém. Soc. Sc. Nat. Cherbourg XIII. (ser. 2, t. III), 1867, p. 274.

D. 53; A. 43; P. dextr. 4; P. sin. 1.

Pectorals minute, composed of very fine hair-like rays. Snout without papillae or tentacles. Brownish, variegated with darker (ARTEDI).

Habitat: Ambon.

Note. We have examined the specimen mentioned by KAUP, l. supra c. in the Paris Museum. This specimen, collected by DUVAUCEL in Bengal, is probably a young *Synaptura orientalis* Bl.

2. Solea irrorata (Kuhl) Rüpp.

Solea irrorata Rüppell, Samml. des Senckenberg. Museum 1852, p. 19.

RÜPPELL does not give a diagnosis, but cites KUHL as author of the species. We have not been able to find, where KUHL published the description of this fish.

The specimen of RÜPPELL came from the Java-sea.

APPENDIX.

1. Solea margaritifera Gthr.

GÜNTHER (Cat. Brit. Mus. IV. 1862, p. 468) said about the habitat of this species that although the typical specimen is stated to be from Borneo, he doubts whether this is correct, as it is closely allied to the mediterranean *S. lascaris* and as the collector Sir E. BELCHER has collected also on the N.W. coast of Africa.

Specimens in the British Museum and the Zoological Museum of Amsterdam from West Africa quite agree with GÜNTHER's type so that the supposition of this author that the species is west african and not from Borneo is certainly correct.

We consider it to be a synonym of *S. lascaris*. Mr. TATE REGAN is of the same opinion.

2. Aseraggodes Kaup.

(Kaup, Archiv f. Naturgeschichte 1858, p. 103).
Jordan & Starks, Proc. U. S. Nat. Mus. XXXI. 1907, p. 229.
M. Weber, Siboga Exp. Fische 1913, p. 415.

Oblong. Scales ctenoid on both sides. One straight lateral line on each side. Eyes on right side. Anterior nostrils on both sides tubular; posterior nostril on right side a slit, above mouth, looking downwards (allways?), on left side the posterior nostril is (allways?) tubular, behind and above the anterior one. Left side of head more or less covered with papillae or filaments, which form a fringe along profile of head and opercular border. Mouth more or less contorted. Minute teeth on left rami of jaws only. Dorsal beginning on snout. Dorsal and anal separate from caudal. Their rays simple or divided at tip; those of caudal divided. Pectorals wanting. Ventrals symmetrical or nearly symmetrical, short-based, free from anal. Anus median. Gill-membranes united, free from isthmus.

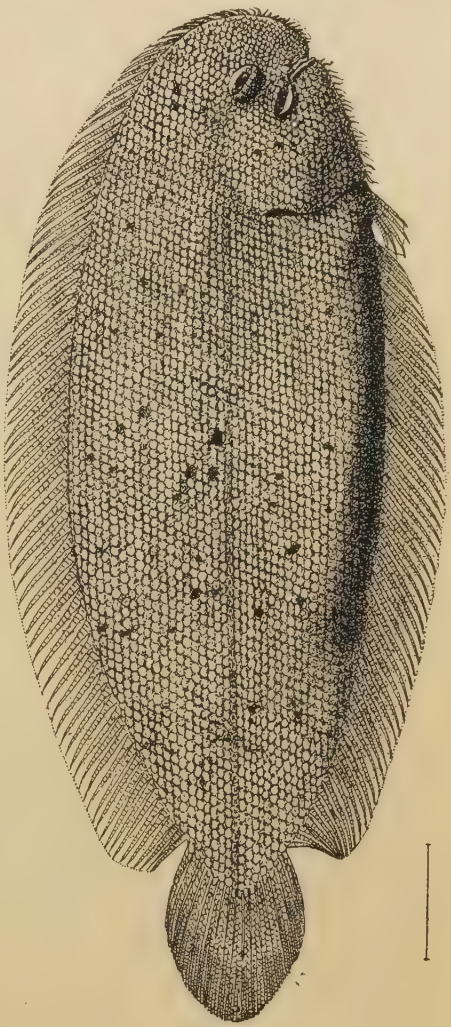

Fig. 39. *Aseraggodes dubius* M. Web. × 1 1/2.

Distribution: From Arabian sea, Bay of Bengal to Japan and to Bougainville island and Australia. Most species occur in deep-sea; one species from freshwater.

Key to the indo-australian species of Aseraggodes.

A. Eyes close together. First dorsal ray filamentous. Height of caudal peduncle somewhat more than postorbital part of head. . . . . *A. filiger* p. 152.

B. Eyes separate. First dorsal ray not filamentous. Height of caudal peduncle equal to postorbital part of head or less.

a. L.l. about 93 . . . . . *A. microlepidotus* p. 153.

b. L.l. 66—84.

a'. Upper eye only slightly in advance of lower one, $1^1/_2$ its diameter from end of snout. Body with more or less regularly arranged black blotches. L.l. 73—80. . . . . *A. cyaneus* p. 154.

b'. Upper eye distinctly in advance of lower one.

α. Interorbital space equal to one eye-diameter. Head and body reticulated with brown. . *A. kaianus* [1]) p. 155.

β. Interorbital space one half or one third of diameter of eye.

α'. V. 5. L.l. 66—75. L. tr. 56—48.

1. L.l. 75. L.tr. 56. Height of caudal peduncle less than postorbital part of head. Body marbled with dark . . . *A. texturatus* p. 155.

2. L.l. 66—68. L.tr. 48. Height of caudal peduncle equal to postorbital part of head. . . . . *A. dubius* p. 156.

β'. V. 4. L.l. 80—84. L. tr. circa 64 . . . *A. klunzingeri* p. 157.

1. **Aseraggodes filiger** M. Web. [Fig. 40, p. 153].

Aseraggodes filiger M. Weber, Siboga-Exp. Fische 1913, p. 436.

D. 73; A. 50; V. 4; C. 19; L.l. ca. 76; L.tr. 48—49.

Height 2.9, 3.3 in length with caudal. Head 4.3, 5 in length with caudal. Upper eye somewhat in advance of lower one. Eyes 6.3, close together, 1.5 in snout, which is rounded. Mouth strongly curved, reaching below middle of lower eye. Upper lip forming a slight prominent hook at symphysis of upper jaw. Only one tubular nasal aperture can be detected on right side. It is situated near upper lip, in the middle between eye and end of snout. In about the same position the tubular

1) The number of ventral rays in *A. kaianus* is unknown.

anterior nasal opening is situated on the left side, the posterior one, which is also tubular, is situated halfway between mouth and upper profile of head. Left side of head with filaments, especially above and below mouth, where they form single long threads, which are shorter but more numerous on opercles. Dorsal beginning on snout, the first ray filamentous, half as long as head, the following rays are shorter. First rays of anal short but the 8th ray is already as long as half head. Rays of dorsal and anal simple, greater part of those of caudal divided. Ventrals equal, reaching on anal. Scales ctenoid on both sides. Caudal only scaly. Lateral line straight. Height

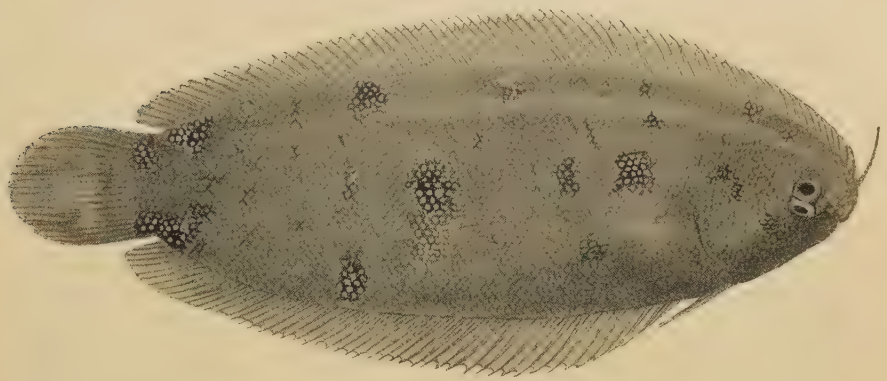

Fig. 40. *Aseraggodes filiger* M. Web. n. s.

of extremely short caudal peduncle somewhat more than postorbital part of head. Colour of alcohol specimen lightbrown on coloured side, with scattered dark patches, formed by black scales, each with a central white spot. Two of these patches at base of caudal, two others before them, some others along lateral line and along base of dorsal and anal. Fins colourless. Left side yellowish white. Length 110 mm.

Habitat: Java-sea off Pekalongan!; Island Rotti 34 M.!.

2. Aseraggodes microlepidotus M. Web.

Aseraggodes microlepidotus M. Weber, Siboga-Exp. Fische 1913, p. 438.

D. 70; A. 53; V. 5; C. 18; L.l. about 93; L.tr. about 66.

Height 2.8, 3.1 in length with caudal. Head 4, 4.8 in length with caudal. Eye 4.5. Upper eye slightly in advance of lower one. Interorbital space somewhat concave, equal to half dia-

meter of eye. Snout somewhat longer than eye; in its middle, near upper lip, one wide tubular nasal opening on right side, a similar but shorter one on left side. Mouthopening gently curved, on right side; stronger on left side reaching to below first third of lower eye. Some short papillae above mouth on left side. From chin to opercles a border of thread-like tentacles. Dorsal beginning before eye, none of its rays enlarged. Ventrals subequal, reaching on anal. Scales ctenoid. Caudal only scaly and with divided rays. Rays of other fins simple. Height of extremely short caudal peduncle less than postorbital part of head. Colour of alcohol specimen dark reddish brown, with indistinct blackish patches on body and fins. Left side lighter, uniform. Length of single specimen known 92 mm.

Habitat: Saleh bay, Sumbawa, 274 M.!.

3. Aseraggodes cyaneus (Alc.).

Solea cyanea Alcock, Ann. Mag. Nat. Hist. (6) VI. 1890, p. 439.
? *Solea umbralitis* [1]) Alcock, Journ. Asiat. Soc. Bengal LXIII. 1894, p. 131.
Solea cyanea M. Weber, Siboga-Exp. Fische 1913, p. 435.

D. 73—82; A. 53—57; V. 5; L.l. 73—80 [2]); L.tr. 56—64.

Height 2.3—2.5, 2.8—3 in length with caudal. Head 3.6—4.1, 4.4—4.9 in length with caudal. Eyes about 7, with swollen circular eyelids, which, in preserved specimens, often hide the greater part of this organ. Upper eye only slightly in advance of lower one, $1\frac{1}{2}$ its diameter from end of snout. Interorbital space less than eye, slightly concave, scaly. Mouthopening gently curved and only slightly shorter on blind side than on coloured side, where it reaches to below middle of eye. Anterior nostril on both sides with a short tube, situated above middle of mouth. Posterior nostril on coloured side a large transverse slit, covered by a cutaneous flap, just in front and partly below lower eye. Posterior nostril on blind side midway between corner of mouth and dorsal profile of head. Head on blind side with short papillae and longer fringes along ventral profile and on opercular border. Dorsal beginning on snout before upper eye, preceded by some fringes. All finrays, those of caudal excepted, simple. The anterior rays shorter than the posterior ones. Ventrals subequal, reaching on anus. Scales

1) A misprint for *umbratilis*, which name occurs in the „explanation of plates".
2) Counted to head.

ctenoid. Vertical fins scaleless, excepting the caudal. Height of extremely short caudal peduncle equal to postorbital part of head. Colour of alcohol specimens reddish brown, with numerous black blotches, formed by groups of black scales and disposed in three longitudinal rows: one along lateral line, the two others along base of dorsal and anal. The blotches of the three rows are placed more or less vertically above each other, forming about five cross rows, less distinct in older specimens, where also intermediate blotches occur. Vertical fins with dark stripes between the finrays. Length 125 mm.

Habitat: Timor sea, 216 M.! — Bay of Bengal, 59 M., Arabian sea? Sea of Oman? *(A. umbratilis).*

4. **Aseraggodes kaianus** (Gthr.).

Solea kaiana Günther, Challenger Rep., Zoology I. Shore Fishes, 1880, p. 49.

D. 70; A. 50; V. 4; L.l. ca. 70.

Height 2.5, somewhat more than 3 in length with caudal. Head somewhat less than 4, about 4.5 in length with caudal. Eye about 5.5, the upper one somewhat in advance of lower and separated by more than its length from frontborder of snout. Interorbital space scaly, equal to diameter of eye. Mouth gently curved, reaching to below anterior half of eye. Dorsal beginning before upper eye, the anterior rays the shortest. Right ventral slightly longer than left one, somewhat more than snout. Height of extremely short caudal peduncle equal to postorbital part of head. Scales strongly ctenoid on both sides. Rays of vertical fins simple, excepting those of caudal. Colour light brownish; head, body and fins reticulated with brown, the network being more distinct towards the margin of the fish. Length of single specimen known 113 mm. [Type in British Museum seen by us].

Habitat: Kei-islands 232—252 M.!

5. **Aseraggodes texturatus** M. Web. [Fig. 41, p. 156].

Aseraggodes texturatus M. Weber, Siboga-Exped. Fische, 1913, p. 437.

D. 72; A. 53; V. 5; C. 19; L.l. 75; L.tr. 56.

Height 2.3, 2.8 in length with caudal. Head 4, 4.8 in length with caudal. Upper eye one half eyediameter in front of lower one and separated by one eyediameter from frontborder of

snout. Interorbital space concave, scaly, one third of eye. Eye 5. The strongly curved mouthopening reaches to below middle of lower eye. One tubular nostril on each side of head, that of right side in front of lower eye. Left side of head with short papillae, which are long and threadlike along chin and lower profile of head. Origin of dorsal before upper eye. First rays shorter than succeeding ones. Ventrals about equal, reaching on anal. Scales ctenoid on both sides. Only the caudal is scaly and has divided rays, those of other fins simple, except

Fig. 41. *Aseraggodes texturatus* M. Web. n.s.

some rays, which are divided at their tip. Height of extremely short caudal peduncle less than postorbital part of head. Colour of alcohol specimen greyish brown on coloured side, many scales have a black hindborder, giving a marbled appearance to this side of the fish. Besides there are some larger darker patches as well as scattered yellowish ones. Left side yellowish white. All fins white with dark, elongate patches, parallel to the fin rays. Length of single specimen known 95 mm.

Habitat: Timor-sea, 216 M.!.

6. **Aseraggodes dubius** M. Web. [Fig. 39, p. 151].

Aseraggodes dubius M. Weber, Siboga-Exp. Fische 1913, p. 438.

D. 67—70; A. 46—51; V. 5; C. 18; L.l. 66—70; L.tr. 48.

Height 2.5—2.8, 3—3.1 in length with caudal. Head 4—4.2, 4.9—5 in length with caudal. Eye 5.5. Upper eye half before upper one, separated from frontmargin of snout by a little more than one eyediameter. Interorbital space scaly, concave, equal to half diameter of eye. Mouthopening strongly curved, reaching to below anterior half of eye. One tubular nasal

opening before lower eye, near to upper lip. A similar one on blind side. A row of short tentacles from chin to opercles. Dorsal beginning before eye, its anterior rays shorter than following. Rays of caudal divided, those of other fins simple. Right ventral somewhat longer than left one, reaching on anal. Scales ctenoid on both sides. Caudal alone scaly. Height of extremely short caudal peduncle equal to postorbital part of head. Colour of alcohol specimen uniform greyish brown. Fins somewhat lighter. Length 85 mm.

Habitat: Java-sea, 82 M.! (type of the species); Java-sea, 40 M.! (S. S. Gier); Bali, St. Nicolaas-bay, 100—162 M.! (S. S. Gier).

Note. Lastnamed specimen from Bali is somewhat less elongate but agrees otherwise. This species shows much resemblance to *Achirus poropterus*, from which it differs principally by the ventrals being free from anal.

7. **Aseraggodes klunzingeri** (M. Web.).

Pardachirus klunzingeri M. Weber, Nova Guinea V. livr. 2, 1908, p. 250.
Aseraggodes klunzingeri M. Weber, Nova Guinea IX. livr. 4, 1913, p. 588.

D. 69—75; A. 53—55; V. 4; L.l. ca. 80—84; L. tr. ca. 64.

Height about 3, about 4 in length with caudal. Head about 4, about 5 in length with caudal. Eye 4.5—5. Upper eye half its diameter in front of lower one. Interorbital space slightly concave, scaly, equal to about half diameter of eye. Lower eye twice in its distance from frontborder of snout. Mouth gently curved on right side, reaching to below middle of eye. Posterior nostril a large opening, close before lower eye; before it, but behind middle of snout the tubular anterior nasal opening, near upperlip. On blind side the anterior nostril is situated above middle of mouthopening, the posterior one midway between corner of mouth and dorsal profile. Left side of head with papillae. Dorsal beginning with some indistinct rays, covered by skin, slightly above point of snout, posterior rays longer. Ventrals reaching with their tip on anal. Scales ctenoid on both sides. Dorsal and anal scaly at their basal half only, caudal more covered by scales. Caudal rays divided, as well as most of the dorsal and all anal rays near their tip. Colour of alcohol specimens reddish brown with dark blotches, situated

along base of dorsal and anal and along lateral line. Sometimes the fins have roundish dark spots. Length 122 mm.

Habitat: South New Guinea (Merauke!, Lorentz river!). In brackish and fresh water.

3. Liachirus Günther.

(Günther, Cat. Brit. Mus. IV. 1862, p. 479).

Scales smooth on both sides. A straight lateral line on both sides, besides a second one on blind side along the upper profile of the neck, commencing on snout. Eyes on right side.

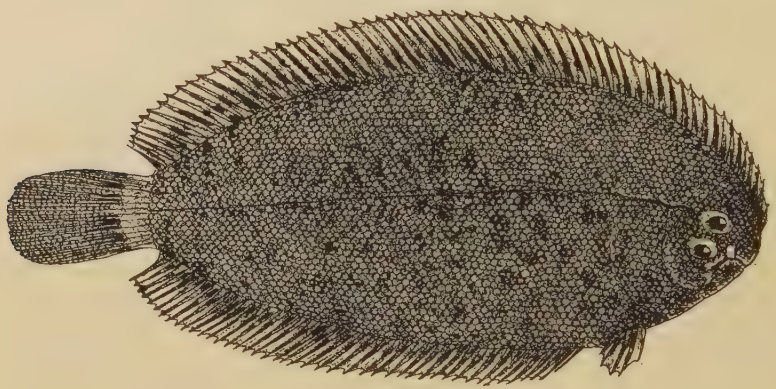

Fig. 42. *Liachirus melanospilus* (Blkr.) × 5/4.

Left side of head with a series of short barbels along its lower profile. Mouth curved, somewhat asymmetrical, rather narrow. Minute teeth on blind side of jaws only. Dorsal beginning on snout. Dorsal and anal separate from caudal. Dorsal and anal rays not scaly, simple, without pores at their base. Caudal rays devided at their tip. Pectorals wanting. Ventrals asymmetrical, right one with longer base than left one. Both ventrals free of anal. Gillmembranes confluent, free from isthmus.

Distribution: Japan, China to indo-australian Archipelago.

1. Liachirus melanospilus (Blkr.).

[Fig. 42, p. 158, Fig. 43, p. 159].

Achirus melanospilos Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 257.
Achirus melanospilus Bleeker, Atl. ichth. VI. 1866—1872, p. 23.
Liachirus nitidus Günther, Cat. Brit. Mus. IV. 1862, p. 479.
Liachirus nitidus Steindachner, Sitz. Ber. Akad. Wien LXVI. 1867, p. 588.

Liachirus nitidus Jordan & Evermann, Proc. U. S. Nat. Mus. Wash. XXV. 1902, p. 366.
Liachirus nitidus Fowler & Bean, Proc. U. S. Nat. Mus. LVII, 1922, p. 67.

D. 56—64; A. 44—50; V. 5; L.l. 70—75.

Height 2.4—2.5, 2.7—2.9 in length with caudal. Head 3.7—3.8, 4.6—4.7 in length with caudal. Eyes 5.2—5.6, the frontborder of the lower one below middle of upper eye, which is one eyediameter from frontborder of snout. Interorbital space about two thirds of diameter of eye, slightly concave and scaly. Mouth curved, reaching to below frontborder of eye. Anterior nostril of coloured side a wide thinwalled tube, that of blind side shorter and thicker. Dorsal beginning near tip of snout, its longest rays longer than half head, ending close to caudal and opposite to end of anal. Dorsal and anal rays simple, those of caudal split at their top. Right ventral with a somewhat longer base than left one, the first ray of lastnamed opposite to second ray of right one. Ventrals free from anal. Scales smooth on both sides. Lateral line developed on both sides; a second one along dorsal profile of head on blind side from snout to nape. Colour of alcohol specimens brownish, freckled with dark spots. Vertical fins with brown spots. Length 94 mm. [Specimens of BLEEKER's collection of *A. melanospilus* and type of *Liachirus nitidus* in British Museum seen by us].

Fig. 43. Blind side of head of *Liachirus melanospilus* (Blkr.) × 5/6.

Habitat: Singapore; Celebes (Menado); Batjan; Amboina. — Formosa, China.

Note. *Liachirus nitidus* as described by JORDAN & STARKS (Proc. U. S. Nat. Mus. XXXI. 1906, p. 231) from Japan seems to be another species with smaller scales (L.l. 92).

4. Achirus Lacépède.

(LACÉPÈDE, Hist. Nat. Poissons IV. 1802, p. 659)
M. WEBER, Siboga-Exp. Fische 1913, p. 415.

Scales ctenoid on both sides, sometimes seemingly smooth on blind side through wear. A straight lateral line on both

sides. Eyes on right side. Left side of head covered with papillae and with a fringe of barbels from chin along ventral profile of head and along opercular border. Mouth curved or very strongly curved. Minute teeth on blind side only. Rays of dorsal and anal simple or divided, those of caudal always divided. Caudal free from dorsal and anal or connected with

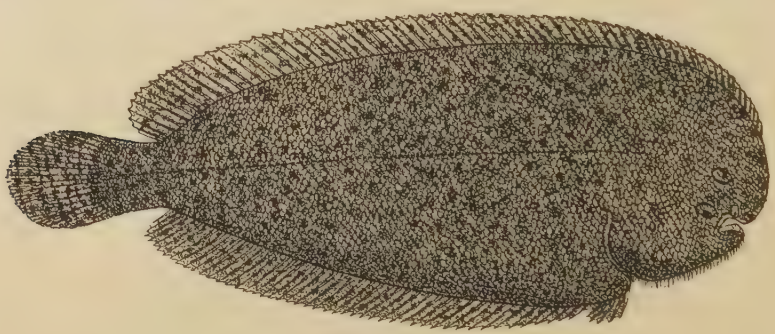

Fig. 44. *Achirus poropterus* Blkr. × $1^1/_2$.

a low membrane. Pectorals wanting. Right ventral [1]) with a long base, reaching from gillopening to anal, with which it is connected by a membrane. Left pectoral shorter, free from anal. Anus asymmetrical. Gillmembranes united, free from isthmus.

Distribution: Indic, Pacific and Atlantic.

Key to the indo-australian species of Achirus.

A. Mouth strongly curved. Snout hook-like, curved downwards, its tip almost in vertical through frontborder of upper eye. Anterior nostrils of blind side fringed *(Amatè)*. . . . . *A. hartzfeldi* p. 161.

B. Mouth moderately curved, rather small. Anterior nostril on blind side a simple tube *(Achirus)*.

a. Dorsal and anal ending at some distance of caudal. L.l. 63—72 . . . . . *A. poropterus* p. 162.

b. Dorsal and anal connected to caudal by a low membrane. L.l. 82 . . . . . *A. abnormis* p. 163.

1. Achirus hartzfeldi Blkr. [Fig. 45, p. 161].

Achirus Hartzfeldii Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 123. — Atl. ichth. VI. 1866—1872, p. 25.

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1) See however under *A. abnormis*.

Aseraggodes Hartzfeldi Kaup, Archiv Naturgesch. XXIV. 1, 1858, p. 103.
Solea hartzfeldii Günther, Cat. Brit. Mus. IV. 1862, p. 471.
Solea oculus Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 285.
Achirus hartzfeldii Evermann & Seale, Bull. Bur. Fish. XXVI. 1906, p. 106.

D. 88—101; A. 61—65; V. 5; L.l. 97—102.

Height 2.5—2.8, 2.9—3.3 in length with caudal. Head 3.8—4, 4.3—4.6 in length with caudal. Upper eye more than half its length in advance of lower one, separated by a scaly flat interspace, which is three fifths or two thirds of diameter of eye. Anterior nostril on coloured side a rather wide short tube, a short distance before lower eye; on the blind side the anterior nostril consists of a thick fleshy tube, the upper border surrounded by fringes and the lumen partly filled up with a spongy tissue.

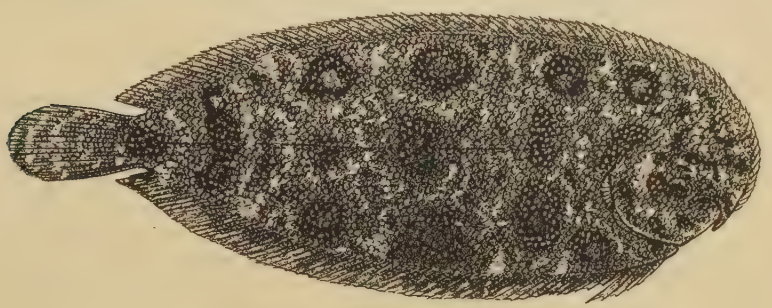

Fig. 45. *Achirus hartzfeldi* Blkr. n.s.

The posterior nostril of this side is a short simple tube. Mouth very strongly arched, ending below anterior half of eye. The snout is curved hook-like over the mouth. Dorsal beginning on hook of snout, below upper eye, its rays subequal and somewhat shorter than that of anal. Anal and dorsal rays simple, those of caudal divided and scaly. Scales strongly ctenoid on both sides. Base of left ventral somewhat shorter than that of right one, which reaches from gillopening to anus. Colour of alcohol specimens purplish brown, with wavy anastomosing lighter lines, which surround irregular darker spots or rings. Eight large ocelli, consisting of two concentric dark rings, surrounded by a light area, in two rows, one along base of dorsal and the other along base of anal. Sometimes a row of similar ocelli on lateral line. Vertical fins with blackish spots and stripes. Length 130 mm.

Habitat: Malacca Straits!; Sumatra; Bawean island!;

Flores; Timor; Ceram; Ambon; Obi!; Ternate; New Guinea (Doreh). — Philippines, British India!.

Note. This species has also been recorded from Japan by NYSTRÖM and SMITH and POPE. We suppose that it has been confounded with *A. japonica*, which is not the same as *A. hartzfeldi* as supposed by JORDAN and STARKS (Proc. U. S. Nat. Mus. XXXI. 1907, p. 288).

2. Achirus poropterus Blkr. [Fig. 44, p. 160].

Achirus poropterus Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 410. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 19.
Achirus Thepassi Bleeker, Nat. Tijdschr. Ned. Indië VI. 1854, p. 500.
Aseraggodes poropterus Kaup, Archiv Naturgesch. XXIV. 1858, p. 103.
Solea thepassi Günther, Cat. Brit. Mus. IV. 1862, p. 478.
Achirus poropterus Bleeker, Atl. ichth. VI. 1866—1872, p. 24.
Achirus Thepassi Bleeker, l.c.
Achirus poropterus? Jouan, Mém. Soc. Sc. Nat. Cherbourg XIII. (Ser. 2 T. III) 1867, p. 275.
Solea (Achirus) poropterus Klunzinger, Sitzber. Akad. Wien 1880, p. 408.
Solea (Achirus) poroptera Macleay, Proc. Linn. Soc. N.S. Wales IX. 1884, p. 51.

D. 62—70; A. 45—49; V. 5; L.l. 63—72.

Height 2—2.5, 2.5—3 in length with caudal. Head 3.2—3.7, 4—4.6 in length with caudal. Eyes 5—6, the upper one somewhat in advance of lower one and separated from frontborder of snout by more than its length. Interorbital space flat, scaly, one half or somewhat more than one half of diameter of eye. Anterior nostril on coloured side and both nostrils on blind side short tubes, posterior nostril on coloured side a wide horizontal slit before lower eye and above corner of mouth. Mouth curved, short, ending before lower eye. Blind side of head covered with papillae and fringes, which are longer on chin, along ventral profile and along opercular border. Dorsal beginning near point of snout with a thick fold of the skin, in which the first dorsal rays are difficult to detect. Dorsal and anal ending at some distance of caudal. Posterior dorsal rays, all anal rays and caudal rays divided, at least at their tip. Scales ctenoid, but those of blind side often almost smooth. Colour of alcohol specimens brownish or blackish on coloured side, with indistinct spots or wavy lines. Vertical fins with dark spots or short stripes. Length 66 mm.

Nom. indig.: Mata-sablah (Malay Batavia).

Habitat: Simalur!; Nias; Sumatra (Tandjong, Padang, Priaman); Java (Batavia, Palabuan Ratu!); Celebes (Menado); Karakelang Islands (Beo)!; Flores!; Ambon; Ceram!; Waigeu.— Hongkong?, Indian Ocean, North Australia.

In sea and estuaries.

Note. We do not think it necessary to separate *A. thepassi* from *A. poropterus*, the only difference being the somewhat greater height of the body. There is no difference in the scales, judging at least from the specimen of *Solea thepassi* in the British Museum mentioned by GÜNTHER. We do not understand how GÜNTHER was able to count 80 scales, as one of of us, who examined the specimen as well as Mr. NORMAN of the British Museum were not able to count more than 69 scales.

3. Achirus abnormis n.sp.

D. 68; A. 55; V. 5; L.l. 82.

Height 1.8, 2.1 in length with caudal. Head 4, 4.7 in length with caudal. Eyes about 7, the upper one somewhat in advance of the lower one and separated from frontborder of snout by nearly twice its length. Interorbital space concave, scaly, not much less than one eye-diameter. Anterior nostril on coloured side funnel-shaped, with a valve at its anterior border, that of blind side with a rim only. Mouth small, somewhat curved, ending before and somewhat below eye. Lips fringed. Blind side of head with fringes, specially on chin and along opercular border. Dorsal beginning near point of snout. Dorsal and anal connected with caudal by a membrane, which is lower than that between the last dorsal and anal rays, the distance between last dorsal or anal ray and neighbouring caudal ray is slightly more than that between the posterior dorsal or anal rays. Therefore, although the vertical fins are united, the caudal can easily be recognized as such and the fins are not confluent in a degree as f.i. in *Synaptura*. The right ventral is free, and the left ventral is united with the anal. The anus and the genital porus are situated between the two ventrals. Ventral rays as well as posterior dorsal and anal rays and all caudal rays divided. Scales ctenoid on both sides, extending on basal part of vertical fins. Colour of alcohol specimen reddish brown, mottled with darker small spots, which form stripes on the finrays. Length of single specimen 59 mm.

Habitat: The specimen was collected by the naturalist on board the Fishery Investigations steamer „Gier" on the fishmarket of Makassar, Celebes! [Type in the zoological museum of Amsterdam].

Note. This species departs from all other *Achirus* by the long dorsal and anal, which almost reach to the caudal and are connected with it by a membrane. This condition is not brought about by a former injury and following regeneration, but looks quite normal. The unusual condition of the ventrals, the right one and not the left one being connected with the anal, may be an individual abnormality; more material is necessary to settle this point. Perhaps that it will be advisable later on, when more specimens can be examined, to create a new genus for it. For the moment we consider it as an *Achirus*, developed in the direction of the *Synaptura*-group.

5. **Pardachirus** Günther.

(Günther, Cat. Brit. Mus. IV. 1862, p. 478).

Oblong. Scales feebly ctenoid, the smaller ones along vertical fins cycloid. Through wear many other scales become cycloid too. A straight lateral line on both sides, besides a second

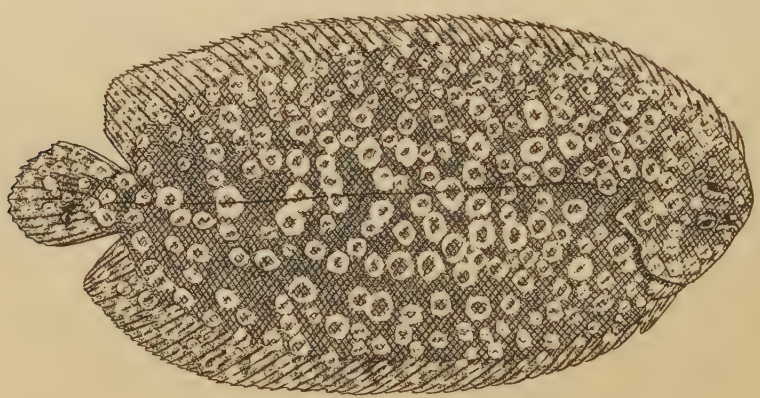

Fig. 46. *Pardachirus pavoninus* (Lac.) $\times$ $^{7}/_{12}$.

one on blind side along the upper profile of the neck, commencing on the snout. Eyes on right side. Anterior nostril a wide tube above middle of mouth; posterior one before eye. Nostrils on blind side both narrow tubes, situated above each

other at some distance above middle of mouth. Left side of head covered with rather long filaments, forming a fringe along lower profile and opercular borders of both sides. Mouth strongly contorted, more developed on right side than on blind side. Minute teeth on left rami of jaws only. Dorsal beginning on snout. Dorsal and anal rays separate from caudal. All vertical finrays divided. Each dorsal and anal ray with a pore at its base. Pectorals wanting. Ventrals unsymmetrical. Right one long-based, its membrane attached posteriorly on base of first anal ray. Left one short-based and less developed. Anus asymmetrical, on right side. Gillmembranes confluent, free from isthmus.

Distribution: Indic and Westpacific.

1. **Pardachirus pavoninus** (Lac.). [Fig. 46, p. 164].

Achirus pavoninus Lacépède, Hist. Nat. Poissons IV. 1802, p. 658, 661.
Achirus maculatus (Kuhl & v. Hasselt) Bleeker, Nat. en Geneesk. Arch. N. Indie II. (3) 1845, p. 509.
Achirus pavoninus Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1207.
Achirus marmoratus Rüppell, Samml. des Senckenb. Mus. 1852, p. 19 (nec. Lac.).
Achirus pavoninus Bleeker, Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 18.
Pardachirus pavoninus Günther, Cat. Brit. Mus. IV. 1862, p. 479.
Achirus pavoninus Bleeker, Atl. ichth. VI. 1866—1872, p. 24.
Solea (Pardachirus) pavonina Steindachner, Sitzber. K. Akad. Wiss. Bd. LX. 1870, p. 570.
Pardachirus pavoninus Macleay, Descr. Cat. Austr. Fish. II. 1881, p. 136.
Achirus pavoninus Day, Fishes of India 4°, 1878—1888, p. 427.
Pardachirus pavoninus Günther, Fische der Südsee, Heft VIII. 1909, p. 347.
Pardachirus pavoninus Kendall & Goldsborough, Mem. Mus. Comp. Zool. Harvard Coll. vol. XXVI. N°. 7, 1911, p. 332.
Pardachirus pavoninus Ogilby, Mem. Queensl. Mus. vol. V. 1916, p. 142.
Pardachirus pavoninus Fowler & Bean, Proc. U.S. Nat. Mus. vol. 62, 1922, p. 67.
Pardachirus pavoninus Norman, Biol. Results „Endeavour", Fisheries Australia, vol. V, prt. 5, 1926, p. 288.

D. 63—68; A. 49—52; V. 5; L.l. 85—90.

Height 2.1—2.3, 2.3—2.8 in length with caudal. Head 3.9—4.7, 4.6—5.4 in length with caudal. Eye 6—8, the upper one slightly in advance of lower one and one and a half its diameter from frontborder of snout. Interorbital space scarcely concave, less than one eyediameter. Corner of mouth just before or somewhat beneath frontborder of eye. Posterior rays of dorsal and anal longer than the rest; the last 5 rays however rapidly decreasing in size, the outline of these fins being there-

fore truncate behind. Right ventral equal to postorbital part of head, longest ray of left ventral somewhat shorter. Colour of alcohol specimens light or darker reddish brown, densely spotted on head, body and fins with roundish light patches, which are bordered by a dark line and have generally a blackish spot in their centre. Length more than 200 mm.

Nom. indig. Mata sablah (Malay Batavia).

Habitat: Singapore!; Nias; Sumatra (Siboga); Banka; Java (Batavia, Surabaya); Madura!; Celebes (Makassar!, Bonthain, Badjoa, North Celebes); Saleyer 18—45 M.!; Rotti!; Batjan; Ternate; Ceram; Aru-islands!; South New Guinea!. — West to Andamans [1]), north to Riu Kiu Islands, Philippines, east to Tonga islands and south to North Queensland.

6. **Synaptura** Cantor.

(Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1204).
Brachirus Swainson, Nat. Hist. II. 1839, p. 303 [2]).

Eyes on the right side. Scales ctenoid on coloured side, cycloid or ctenoid on blind side. One straight lateral line on both sides. Anterior nostril of coloured side at the end of a

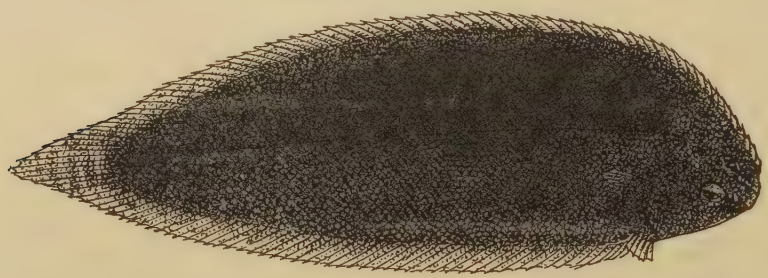

Fig. 47. *Synaptura villosa* M. Web. n.s.

shorter or longer tube, posterior ones covered by a flap. Nostril on blind side more or less hidden by a cutaneous flap. Scales of left side of head often transformed into cutaneous filaments. Lower lip on coloured side generally fringed.

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1) Pellegrin (Bull. Soc. Zool. XXXIX. 1914, p. 229) records this species from Madagascar. Probably this is *P. marmoratus* Lac., which possibly is only a synonym of *P. pavoninus*.

2) Preoccupied by *Brachyrus* Swainson l. c. p. 264 and also spelled *Brachirus* on p. 71, with which is meant *Pterois Zebra* Cuv.

Mouth curved, the snout often overhanging the mouthopening and forming a hook. Minute teeth in jaws of left side. Dorsal beginning on snout. Dorsal and anal confluent with caudal. Rays of vertical fins simple or divided at their tip. Pectorals either with well developed rays and with a short base and free from branchiostegal membrane or with a broad base, rudimentary rays and with a connection through a folded membrane with the upper part of the branchiostegal membrane, forming a kind of funnel-like access to the branchial cavity. In some species a transitory arrangement between these extremes exists (e.g. *S. panoides* and *zebra*) in which the base of the pectoral is broader than usual, the upper rays are well developed and where a slight connection exists with the base of the pectoral and the branchiostegal membrane. Therefore we do not think a separation justified between *Synaptura* and *Zebrias* (JORDAN & SNYDER, Annot. Zool. Japon. III. 1901, pt. 2, p. 123). Ventrals short, broad-based, free from each other and from anal; or the right ventral is connected with a low membrane at its posterior end with the genital papilla or with the anal. Gillmembranes united, free from isthmus.

Distribution: Indic and Westpacific. Some species in fresh water.

Key to the indo-australian species of Synaptura.

I. Scales cycloid on blind side, ctenoid on coloured side.
  A. Scales of head and neck larger than the others.
    L.l. 156—170. . . . . *S. commersoniana* p. 168.
  B. Scales of head and neck of same size as the others.
    1. Height 3. D. 71—74. A short tentacle between nostrils on coloured side . . . . . *S. albomaculata* p. 169.
    2. Height 1.8—2.6. D. 64—70. No tentacles between nostrils . . . . . *S. aspilus* p. 170.

II. Scales ctenoid on both sides.
  A. Scales of head and neck larger than the others.
    D. 57—60. . . . . *S. pan* p. 171.
  B. Scales of head and neck of same size as the others.
    1. Eyes close together, without scaly interorbital space.
      a. Head and body without crossbars.
        α. Head on blind side without filaments. *S. macrolepis* p. 171.
        β. Head on blind side with filaments . . *S. mülleri* p. 172.
      b. Head and body with crossbars.

α. D. 84—87. L.l. circa 120 . . . . . *S. callizona* p. 173.
β. D. 64—68. L.l. 85—95 . . . . . *S. quagga* p. 173.

2. Eyes separated by a scaly interorbital space.
a. Head and body without crossbars.
α. D. 80—83. A. 63. L.l. about 110 . . *S. panoides* p. 174.
β. D. 61—69. A. 44—55. L.l. 75—85
α′. Height 2, snout not hooked. . . . *S. orientalis* p. 175.
β′. Height 2.6—2.8. Snout hooked . . *S. villosa* p. 176.
b. Head and body with crossbars.
α. Right pectoral falciform, with the upper rays longer than the lower ones, at least as long as snout and eye. Mouthopening slightly curved, reaching to below anterior border of eye. Interorbital space half diameter of eye . . . . . *S. zebra* p. 177.
β. Right pectoral with a very broad base, less than half eye in length. Mouthopening much curved, reaching to below middle of eye. Interorbital space less than half diameter of eye . . . . . *S. altipinnis* p. 178.

Doubtful species . . . . . *S. lipophthalma* p. 179.

1. Synaptura commersoniana (Lac.) Cant.

Pleuronectes commersonianus Lacépède, Hist. Nat. Poissons III. 1802, pl. 12, fig. 2
Brachirus commersonii Swainson, Nat. Hist. Fishes etc. II. 1839, p. 303.
Synaptura commersoniana Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1204.
Solea Russellii Bleeker, Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 15.
Synaptura commersoniana Günther, Cat. Brit. Mus. IV. 1862, p. 483.
Synaptura commersoniana Bleeker, Atl. ichth. VI. 1866—1872, p. 18.
Synaptura commersoniana Day, Fishes of India 4°, 1878—1888, p. 428.

D. 71—81; A. 57—63; P. dextr. 8—9, P. sin. 6—8; V. 2—4; L.l. 156—170.

Elongate; height 3.4, 3.7 in length with caudal. Head 5.6, 6.2 in length with caudal. Eye 7.5, the upper one almost totally before the lower one; interorbital space scaly, less than one eye diameter; both nostrils on right side have swollen tubes, close to each other in front of lower eye. On the blind side the nostrils are concealed by a flap of the skin. Mouth curved, reaching somewhat behind middle of lower eye. Snout hooked. Lower lip on right side with a row of fleshy tentacles. Origin of dorsal in front of upper eye from which it is separated by 1.5—2 eye diameters. Rays of vertical fins divided

at their tip, the membrane of the fins is rather thick and scaly in its proximal part. Right pectoral equal to snout, left pectoral to snout and eye, the right one scaly, both short based. Sometimes the left pectoral is shorter than the right one. Ventrals equal to snout, united with each other and with anal. Anus on left side. Scales of head and neck larger than the others, ctenoid on right side, cycloid on blind side, but provided with more or less developed soft filaments on head. Opercular border with similar filaments. Colour of alcohol specimens reddish brown, lighter below. Vertical fins with a subterminal dark and a terminal light longitudinal band. Right pectoral blackish. Length 310 mm.

Nom. indig. Lida (Malay Batavia); Ikan sebala (Bagan Api Api).

Habitat: Singapore; Sumatra (Bagan Api Api!); Java (Batavia!); Borneo (Kahajan and Mahakam rivers). — Coast of British India.

In sea and fresh water.

2. Synaptura albomaculata Kp.

Synaptura albomaculata Kaup, Arch. f. Naturgesch. 1858, p. 96.
Synaptura albomaculata Günther, Cat. Brit. Mus. IV. 1862, p. 483.
Synaptura albomaculata Day, Fishes of India 4°, 1878—1888, p. 429.

D. 71—74; A. 56—59; P. dextr. 9, sin. 7; V. 3—4; L.l. 110—140.

Elongate, height 3, 3.5 in length with caudal. Head 5, 5.8 in length with caudal. Eye 6, the upper one half in advance of the lower. Interorbital scaly, about half diameter of eye. Both nostrils on right side with swollen conical tubules. They are close together, before lower eye; a short barbel between them. Mouth curved, reaching beyond middle of lower eye. Snout hooked. Nostrils of blind side hidden by a cutaneous flap. Lower lip with a row of short, fleshy tentacles. Origin of dorsal before middle of upper eye from which it is separated by one eyediameter. Rays of vertical fins, which have a scaly base, divided at their tip. Right pectoral almost equal to snout and eye, left one shorter, both with a short base. Ventrals rudimentary, about as long as eye, united with each other and with anal. Anus on left side. Scales of head and neck on coloured side not larger than the others, ctenoid on

coloured side, cycloid on blind side, but those of head on this side provided with cutaneous filaments and larger than the others. Opercular border with filaments, forming a fringe. Colour of alcohol specimen reddish brown, with small white spots, widely separated, in 3 longitudinal rows, the middle one along lateral line. Vertical fins blackish with a white border. Right pectoral with a black blotch. Length 300 mm. [Description made after a specimen from Akyab, British India].

Habitat: Singapore (DUNCKER). — Coast of British India!.

3. Synaptura aspilus Blkr.

Synaptura aspilos Bleeker, Nat. Tijdschr. Ned. Indië III. (1851) 1852, p. 74. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 29.
Synaptura marmorata Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 90.
Synaptura heterolepis Bleeker, Act. Soc. Scient. Indo-Neerl. I. 1856, Beschrijving vischsoorten Ambon, p. 65.
Synaptura heterolepis Günther, Cat. Brit. Mus. IV. 1862, p. 482.
Synaptura aspilos Günther, l. c.
Brachirus heterolepis Bleeker, Atl. ichth. VI. 1866—1872, p. 20.
Synaptura heterolepis Günther, Fische der Südsee, Heft VIII. 1909, p. 347.
Brachirus aspilos Ogilby, Proc. Roy. Soc. Queensland, XXIII. 1910, p. 36.
Synaptura aspilus M. Weber, Siboga-Exp. Fische 1913, p. 440.

D. 64—70; A. 50—57; P. 5; V. dextr. 5, sin. 4; L.l. 115.

Height 1.8—2.6, 2.5—3 in length with caudal. Head 3.9—4.4, 4.6—5.5 in length with caudal. Eyes 8—10, twice in snout. Upper eye somewhat before lower one, separated by a scaly interspace which is about equal to diameter of eye. Anterior nostril of coloured side a short tube; nostrils of blind side hidden. Upper jaw prominent. Point of snout hooklike, overhanging mouth, which is curved and reaches to below anterior half of eye. Lips, eyelids and some patches on chin and nape of coloured side filamentous. The scales of the anterior part of the head on blind side are transformed into cutaneous flaps with fringed hindborders. Dorsal beginning near point of snout, in horizontal through lower eye; its first rays somewhat shorter than the posterior ones. Left pectoral rudimentary, as long as eye or longer, right pectoral better developed and nearly twice as long. Right ventral as long as eye and snout, left ventral as long as eye or somewhat more. Right ventral connected by membrane with anal, left ventral only at its base by a low rim, which borders the anus. Scales ctenoid on coloured side, those of nape not large. Scales of blind side

cycloid. Colour of alcohol specimens reddish brown with numerous light spots. Vertical fins with a subterminal dark band and a marginal white one. In older specimens the colour is darker, with diffuse darker patches or nearly uniform. Length 380 mm.

Habitat: Singapore!; Solor; Dammar!; Batjan; Timor; Kei-islands!; Aru-islands!; Ceram; Ambon. — Siam, New-Pommern, Croker Island.

4. Synaptura pan (Ham. Buch.).

Pleuronectes pan Hamilton Buchanan, Fishes Ganges 1822, p. 130.
Synaptura pan Günther, Cat. Brit. Mus. IV. 1862, p. 481 (sine syn.).
Brachirus pan Bleeker, Atl. Ichth. VI. 1866—1872, p. 21.
Synaptura pan Day, Fishes India 4°, 1878—1888, p. 429.

D. 57—60; A. 43—45; P. dextr. 5—6, sin. 4—5; V. 4; L.l. 80.

Height 2, 2.5 in length with caudal. Head 4, 5 in length with caudal. Eyes 8, the upper one almost entirely in front of lower one, somewhat less than snout. Eyes separated by a scaly interorbital space, equal to eye. Mouth gently curved, reaching to below anterior half of eye. Lower lip slightly fringed on coloured side. Anterior nostril of coloured side tubular. Nostrils of blind side concealed. Blind side of head scarcely villose in specimen examined. Dorsal beginning in horizontal through lower border of upper eye, its first rays shorter than the posterior ones. Fins of vertical fins divided. Pectorals subequal, short based, equal to snout and eye. Ventrals with a broad base, free from each other and from anal, about as long as pectorals. Scales ctenoid on both sides, on a broad band from above eye to nape. On both sides the scales are larger than on the rest of the body. Colour of alcohol specimen reddish brown with traces of dark spots and stripes. Length 150 mm. [A specimen of BLEEKER's collection seen by us].

Habitat: Singapore, Bintang, Biliton. — Orissa, Ganges delta, Burma, Siam, South China.

In sea and brackish water.

5. Synaptura macrolepis Blkr.

Synaptura macrolepis Bleeker, Act. Soc. Scient. Indo-Neerl. V. 1858—1859. Twaalfde bijdr. Vischfauna Borneo, p. 7.
Brachirus macrolepis Bleeker, Atl. Ichth. VI. 1866—1872, p. 20.

D. 69—70; A. 52; P. dextr. 3—4, P. sin. 5; V. 3; L.l. 65 to about 75.

Height 2.5, 2.7 in length with caudal. Head nearly 5, about 5.5 in length with caudal. Eyes 10—12, continuous, surrounded together by a fleshy rim. Mouth curved, reaching below anterior part of eye. Snout with a hook, overhanging the mouth. Lower lip crenulate or papillate on coloured side. Head on blind side without filaments. Nostrils of coloured side tubular. Dorsal beginning on snout. Rays of vertical fins divided. Right pectoral about 7, left one about 5.5 in head. Ventrals 3—4 in head, not surrounding the anus, which is situated at the left side. Scales strongly ctenoid on both sides. No enlarged ones on head or nape. Colour yellowish olive, with brownish cloudy markings. Length of single specimen known 223 mm. [After BLEEKER, not seen by us].

Habitat: Borneo (Sinkawang).

6. **Synaptura mülleri** Steind.

Synaptura mülleri Steindachner, Denkschr. Akad. Wien XLI. 1879, p. 4.
Synaptura mülleri Klunzinger, Sitzb. Akad. Wien, LXXX. 1880, p. 408.
Synaptura arafurensis Günther, Challenger Rep. Zool. vol. I. Shore Fishes, 1880, p. 49.
Brachirus muelleri Norman, Biol. Res. „Endeavour" V. part 5, 1926, p. 295.

D. 61—70; A. 48—57; C. 14—15; Ll. 70—78.

Height $2^1/_5$—$2^1/_3$ in total length. Head $4^3/_5$—5. Eyes 5—$5^1/_2$, contiguous, raised above head, the upper a little in advance of lower, subequal in seize, about $1^1/_2$ in snout. Mouth extending to below anterior part of eye. Lower lip of ocular side fringed. Both nostrils of ocular side tubular, simple; the anterior the longer. Right pectoral shorter than eye, upper rays not produced; left pectoral smaller, the upper ray somewhat produced. Ventrals subsymmetrical, free from anal. Scales ctenoid, those of ocular side somewhat more strongly denticulated than those of blind side, which are mostly produced into barbellike processes. A number of similar processes on ocular side of head in the region of the snout, chin, eyes and gillopening. Ocular side of body with a number of strong black filamentous processes, which tend to form irregular groups of which one on the middle of the lateral and two or three near the bases of the vertical fins are most prominent. Brownish, vertical fins dusky in the outer parts on both sides, with paler

margins; right pectoral dusky. [Not seen by us, after Norman].

Habitat: Arafura sea, 63 M. — Eastern coast of Queensland.

7. **Synaptura callizona** Tate Regan.

Synaptura callizona Tate Regan, Ann. Mag. Nat. Hist. (7) XI. 1903, p. 57.

D. 82—87; A. 67—69; P. dextr. 11, P. sin. 9; V. 5; L.l. circa 108—120.

Height 2.6—2.7, 2.9—3 in length with caudal. Head 4.6—4.8, 5.3—5.5 in length with caudal. Eyes 4.7—5, contiguous, the upper one somewhat in advance of the lower. Mouthopening much curved, reaching almost to below middle of lower eye. Lips on coloured side not fringed. Anterior nostril on coloured side tubular; nostrils unconspicuous on blind side. Small tentacles along lower profile of head and opercular border of blind side. Dorsal beginning above and somewhat before upper eye, the anterior rays smaller than the posterior ones. Rays of vertical fins scaly and simple. Dorsal and anal totally confluent with caudal. Pectorals with broad base united to branchiostegal membrane by a folded membrane, their rays shorter than eye; upper rays of right pectoral produced in the type-specimen, $^3/_5$ of head, but not in the specimens seen by us. Ventrals longer than eye, not or only slightly connected at base with anal. Scales strongly ctenoid on both sides. Colour of alcohol specimens yellowish brown, with about fourteen darker cross bars, bent backwards on dorsal and anal and as broad as or broader than interspaces. Right pectoral brown. Length 134 mm.

Habitat: Java-sea! Madura!, Arafura sea!.

8. **Synaptura quagga** (Kaup) Gthr.

?*Aesopia quagga* Kaup, Wiegmann's Archiv 1858, p. 98.
Synaptura quagga Günther, Cat. Brit. Mus. IV. 1862, p. 485.
Synaptura quagga Macleay, Descr. Cat. Austr. Fish II. 1881, p. 136.
Synaptura zebra Day, Fishes India 4°, 1878—1888, p. 430 (nec Bloch).
Synaptura quagga Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 286.
Zebrias zebra Jordan & Seale, Proc. Dav. Acad. Science X. (1905) 1907, p. 17.
Zebrias quagga Hubbs, Proc. U. S. Nat. Mus. vol. 48, 1915, p. 493.

D. 64—68; A. 53—59; P. 6—7; V. 4; L.l. 85—95.

Height 2.4—2.6, 2.9—3 in length with caudal. Head 4.4—4.8, 5.3—5.8 in length with caudal. Eyes 3—4, contiguous and even coalescent, each with a short tentacle, which is seldom

absent. The upper eye slightly in advance of the lower one. Anterior nostril on coloured side with a short tube. Nostrils of blind side unconspicuous. Mouth curved, reaching to below anterior part of eye. Lips without fringes. Dorsal beginning above and slightly before upper eye, the anterior rays shorter than the others. Rays of vertical fins scaly, mostly divided at the tip. Pectorals with a broad base, connected above gill-opening by a folded membrane with branchiostegal membrane. In young specimens the upper rays of the right pectoral are elongate and almost as long as the head, in older ones these rays are not much longer than the eye. Ventrals small, somewhat more than eye, with broad base; the right one connected with genital papilla. Scales ctenoid on both sides. On the snout of the blind side the scales are replaced by short papillae or fringes. A row of fringes along opercular border of blind side. Colour of alcohol specimens light brownish, with ten to eleven darker simple or double crossbars, which are somewhat broader than the interspaces and are continued in an obliquely caudal direction on dorsal and anal. Caudal darker brown with a more or less distinct whitish elongate patch in the middle. Yellowish brown on blind side. Length 150 mm.

Habitat: Different localities in Java-sea! Madura!. — British India and Ceylon, China, Japan [1]), Australia [2]).

Note. In nine specimens examined by us [among which one specimen of BLEEKER's collection labelled *Synaptura zebra*] the tentacles on the eyes and the fringes along the opercular border were only absent in one. DAY l.c. states that the eye-tentacles are present: „in some, not all specimens". Perhaps that both, tentacles and fringes, are only developed in one of the two sexes.

9. Synaptura panoides Blkr.

Synaptura panoides Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 440. Verh. Bat. Gen. XXIV. Pleuronect. 1852, p. 30.
Synaptura panoides Günther, Cat. Brit. Mus. IV. 1862, p. 486.
Brachirus panoides Bleeker, Atl. ichth. VI. 1866—1872, p. 21.

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1) NYSTRÖM, Bihang till Sv. Vet. Akad. Handl. Bd. XIII. Afd. IV. N°. 4, 1887, p. 41. JORDAN & STARKS, Review of the Flounders and Soles of Japan, Proc. U. S. Nat. Mus. XXXI. 1907, p. 161 do not mention this species as inhabiting Japan.

2) According to Mc Culloch, Check-list of fish etc. of N. S. Wales Part II. 1919, p. 36, probably incorrect.

D. 80—83; A. 63; P. dextr. & sin. 4—5; V. 4; L.l. about 110.

Height 2.2, 2.4 in length with caudal. Head 5.4, 6 in length with caudal. Eye 6 or more in head, twice in snout. Upper eye somewhat in advance of lower one, separated by a concave scaly interspace, which is somewhat less than diameter of eye. Anterior nostril on coloured side a short tube, nostrils on blind side covered by filaments of the skin. Mouth curved, reaching to below anterior margin of lower eye. Lips fringed on both sides. Anterior part of head on blind side covered by fleshy filaments, arranged in rows, probably corresponding to sensory canals. Dorsal beginning at a short distance above mouth, the first rays short, as well as those of anal. All rays of vertical fins divided. Pectorals rudimentary, about as long as eye, with a rather broad base, united to branchiostegal membrane. Ventrals subequal, equal to distance between front-margin of lower eye and point of snout; broad-based, but not united with each other. Scales ctenoid on both sides, those of anterior part of body not larger than the posterior ones. Colour of alcohol specimen brownish red with irregular larger and smaller blackish patches and numerous dark spots, which are also present on the vertical fins and on the ventrals. Pectoral of coloured side black, that of blind side whitish. Sometimes remote blackish lines, crossing the body in its whole width, are present. Length 195 mm.

Nom. indig. Lidah (Banjermassin).

Habitat: Singapore; Sumatra (Djambi!, Banju asin, Palembang); Borneo (Pontianak, Kahajan, Banjermassin, Baram River). — Siam.

In sea and rivers.

10. **Synaptura orientalis** (Bl. Schn.).

Pleuronectes orientalis Bloch Schneider, Syst. Ichth. 1801, p. 157.
Solea foliacea Richardson, Rep. 15th Meeting British Ass. Ichth. China 1846, p. 279.
Solea pan Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 410 (nec Ham. Buch.).
Synaptura pan (Cantor) Bleeker, Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 30.
?*Solea trichodactylus* Kaup, Arch. Naturgesch. XXIV. 1. 1858, p. 95 [1]).
Synaptura foliacea Günther, Cat. Brit. Mus. IV. 1862, p. 481.
Brachirus sundaicus Bleeker, Atl. ichth. VI. 1866—1872, p. 20.
Synaptura orientalis Day, Fishes of India 4°, 1878—1888. p. 429.
Synaptura orientalis Jordan & Evermann, Proc. U.S. Nat. Mus. XXV. 1902, p. 366.
Synaptura orientalis Hora, Mem. Indian Mus. V. 1923, p. 759.

1) See page 150.

Brachirus orientalis Norman, Biol. Results „Endeavour". Fisheries Australia vol. V, prt. 5, 1926, p. 293, (compare also for australian synonyms).

D. 61—65; A. 44—48; P. dextr. 7—8; P. sin. 5; L.l. 75—85.

Height 2, 2.2 in length with caudal. Head 4.2—4.7, 4.8—5.3 in length with caudal. Eyes 6—6.8, the upper one slightly in advance of the lower one, separated by a deeply concave, scaly interorbital space, which is somewhat more than diameter of eye. Mouth curved, not quite reaching to below middle of lower eye. Anterior nostril on coloured side a simple short tube. Nostrils on blind side covered by cutaneous appendages or fringes of the scales. Upper jaw slightly prominent, without distinct hook. Dorsal beginning on or somewhat above horizontal through upper margin of eye. Vertical fins scaly, their rays divided at top. Ventrals subequal, as long as distance between lower eye and snout, united at their base, the right one united with anal. Anus at the left side. Right pectoral as long as ventrals, left one shorter. Scales ctenoid on both sides, those of nape not larger than the others. Scales of head on blind side with fringes. A series of fringes also along opercular border. Colour of alcohol specimens brownish red on coloured side, with cloudy indistinct patches or remnants of crossbars, extending on the fins. Right pectoral blackish. Blind side yellowish.

Habitat: Bintang; Singapore; Biliton; Tandjong Pinang, Riouw Archipelago!. — Coast of British India, Indo-China, Formosa, China and East-coast of Australia. In sea and brackish water.

11. **Synaptura villosa** M. Web. [Fig. 47, p. 166].

Synaptura villosa Max Weber, Nova Guinea V. livr. 2, 1908, p. 251. — Nova Guinea IX. livr. 4, 1913, p. 590.

D. 65—69; A. 52—55; P. dextr. 5—6, sin. 5; V. 5; L.l. 66—80.

Height 2.6—2.8, 3—3.2 in length with caudal. Head 4.7—5.6, 5.5—6.5 in length with caudal. Eyes 4.2, equal to snout, separated by less than their diameter, the upper one somewhat before the lower one. Interorbital space scaly. Mouth strongly curved, reaching to below anterior half of eye. Snout hooked, overhanging mouth in front. Anterior nostril on coloured side a rather long tube. Nostrils on blind side hidden by the scales, which are transformed into cutaneous fringed flaps on the anterior part of this side of the head. Lower lip with

tiny fringes. Dorsal beginning on snout on horizontal through upper eye, the first rays short and enclosed in thick skin. Rays of all vertical fins divided. Right pectoral shorter than eye and snout, left one longer than eye. Right ventral somewhat longer than left one and equal in length to left pectoral. Ventrals scarcely united to anal, the last ray of right ventral swollen and rod-like. Scales ctenoid on both sides, no enlarged ones on head or nape. Colour of alcohol specimens reddish brown with irregular rows of dark cloudy spots and darker marmorations, sometimes giving the appearance to indistinct crossbars. Vertical fins freckled with dark spots. Length 105 mm.

Habitat: Rivers and pools of Dutch South New Guinea (Wagani!, Lorentz-river!, Mimika river, Merauke!).

12. Synaptura zebra (Bl.).

Pleuronectes zebra Bloch, Ausländ. Fische III. 1787, p. 27.
Solea zebrina Schlegel, Fauna japonica, Poissons 1846, p. 185.
Solea ommatura Richardson, Ichth. China. Rep. 15th Meeting British Ass. 1846, p. 279.
Synaptura zebra Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1206.
Solea zebra Bleeker, Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 16.
Synaptura zebra Günther, Cat. Brit. Mus. IV. 1862, p. 484.
Synaptura zebra Kner, Novara Exp. Fische, 1865—1867, p. 292 (s. syn.).
Brachirus zebra Bleeker, Atl. ichth. VI. 1866—1872, p. 22.
Zebrias zebra Jordan & Evermann, Proc. U.S. Nat. Mus. XXV. 1902, p. 367.
Synaptura zebra Volz, Revue Suisse Zool. XII. 1904, p. 462.
Zebrias zebrinus Jordan & Starks, Proc. U. S. Nat. Mus. XXXI. 1906, p. 232.
Aesopia zebra Bean & Weed, Proc. U. S. Nat. Mus. XLII. 1912, p. 611.

D. 74—78; A. 65—68; P. dextr. 7, P. sin. 7; V. dextr. 5, sin. 4; L.l. 113.

Height 2.7, 3 in length with caudal. Head 6, 6.5 in length with caudal. Eyes 5.3, the upper one somewhat before the lower one. Interorbital space scaly, half diameter of eye. Anterior nostril on coloured side a short tube; nostrils on blind side without tube, wide apart. Mouth on coloured side slightly curved, reaching to below anterior border of eye. No fringes on lips, or elsewhere on coloured side of head. Dorsal beginning with a thick cutaneous fold before upper eye. Rays of vertical fins divided, scaly. Dorsal and anal totally united with caudal. Right pectoral falciform, as long as eye and snout, left one with a broad base, longest rays as long as eye, the upper part connected by membrane with the branchiostegal membrane. Right ventral with longer base than left one, connected

by membrane to the genital papilla. Ventrals somewhat less than right pectoral. Scales strongly ctenoid on both sides, no larger ones on nape or anterior part of head, absent on snout and chin, where they are replaced by short fringes, which also border the base of the first dorsal rays. Colour of alcohol specimens light brownish yellow, with about twenty darker crossbands on head and body, continued on the fins, where they are bent in a posterior direction. A white bordered dark ocellus on caudal. Length 260 mm.

Nom. indig.: Lida, Lemper belang (Malay Batavia).

Habitat: Singapore; Sumatra (Lower Langkat); Bintang; Banka; Java! (Batavia!); Borneo; Arafura Sea. — From Persian Gulf eastwards to New South Wales [1]), northwards to Japan.

13. Synaptura altipinnis Alc.

Synaptura altipinnis Alcock, Ann. Mag. Nat. Hist. (6) VI. 1890, p. 441. — Journ. Asiat. Soc. Bengal LXV. 1896, p. 329.
Synaptura altipinnis Jenkins, Mem. Indian Mus. III. N°. 1, 1910, p. 29.

D. 75—88; A. 67—74; P. dextr. 10—11, P. sin. 8—9; V. 4—5; L.l. 112—120.

Height 2.4—2.5, 2.7—2.9 in length with caudal. Head 4.7—5.2, 5.5—6 in length with caudal. Eyes 5—7, the upper one somewhat in advance of lower one. Interorbital space less than half diameter of eye, with one row of scales. Mouthopening much curved, reaching to below middle of eye. Lips of coloured side not fimbriate. Lower profile of head with close-set small tentacles, which are also scattered on the blind side of the head. Anterior nostril of coloured side tubular. The dorsal begins above and somewhat before upper eye, the first rays shorter than the posterior ones. Dorsal and anal totally confluent with caudal. Rays of vertical fins scaly, simple or slightly split near top. Pectorals broad-based, united to branchiostegal membrane by a folded membrane, their rays shorter than eye. Ventrals equal, somewhat longer than eye, close together, the right one more or less connected with anal. Scales subequal, strongly ctenoid on both sides. Colour of alcohol specimens brownish, with about fourteen darker crossbars, continued on dorsal and anal. Right pectoral dark brown. Blind side yellowish. Length over 200 mm.

1) According to Mc Culloch (Check-list of fish and fish-like animals of N.S. Wales prt. II. 1919, p. 36) probably incorrect.

Habitat: Java Sea 11—14 M.!; Madura 11—18 M.! — British India, Vizigapatam and Ganjam Coast, 45 M.

Note. The description above is made after three specimens collected by the S.S. „Gier" at 3 different stations. There are slight differences with ALCOCK's description, but we don't esteem them of sufficient importance to base a new species on our specimens.

Doubtful species.

1. Synaptura lipophthalma Karoli.

Synaptura lipophthalma Karoli, Termeszetrajzi füzetek V. 1882, p. 30.

D. + C. + A. = 108; P. sin. 5; V. 3; L.l. 85.

Height about $2^1/_2$ in its length. Head $4^2/_3$. Eyes wanting. Snout somewhat prominent, slightly fimbriated. Mouth curved. Lips and chin without filaments. Teeth in jaws small. Linea lateralis straight. Scales of right side ciliated. Rays of vertical fins divided. Dorsal beginning on snout. Dorsal and anal united with caudal. Right pectoral wanting, left one small. Left ventral longer than right one, $2^1/_2$ in head. Right side brownish grey, clouded with black patches and with six vertical lines. Left side whitish brown. Vertical fins grayish, bordered with black. Length of single specimen 100 mm. [After KAROLI, not seen by us].

Habitat: Borneo (Larawak). In sea.

Note: We suppose that this species has been based on a mutilated specimen as the eyes as well as the *right* pectoral are said to be wanting. It is however not possible to refer it to any of the species mentioned above, it remains even doubtful if it is a *Synaptura* at all.

7. Achiroides Bleeker.

(BLEEKER, Natuurk. Tijdschr. Ned. Indië I. 1851, p. 402).
Eurypleura Kaup, Arch. f. Naturgesch. XXIV. 1858, p. 100.

Eyes on the right side. Scales feebly ctenoid on both sides. One straight lateral line on both sides. Anterior nostril of coloured side at the end of a tube, posterior one with a cutaneous flap. Nostril on blind side a short tube. Scales of blind side round corner of mouth and on chin replaced by fleshy

tentacles. Lips of coloured side with similar but shorter tentacles. Mouth small, twisted and somewhat curved. Snout not forming a prominent hook. Minute teeth in jaws of left side only. Dorsal beginning on snout. Dorsal and anal confluent with caudal. Rays of vertical fins divided or split at the tip

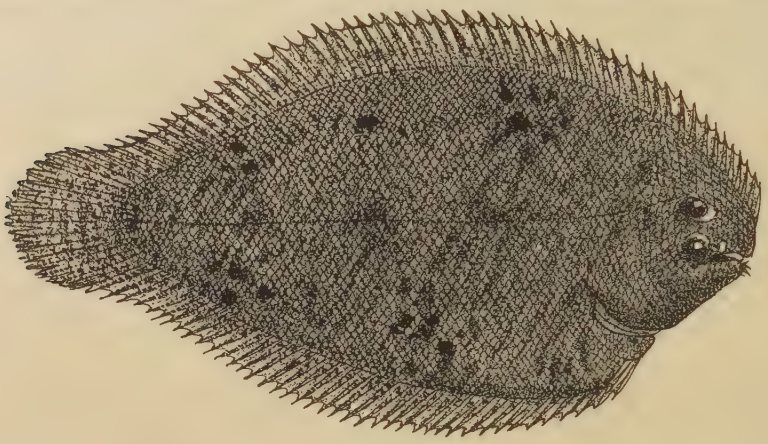

Fig. 48. *Achiroides melanorhynchus* (Blkr.). × 4/3.

only. Pectorals wanting. Ventrals short, rather broad-based, free from each other and from anal. Gillmembranes united, free from isthmus.

Distribution: Two species from the freshwater of the Greater-Sunda Islands, Malacca and Cambodja.

Key to the species of Achiroides.

1. D. 56—61. A. 40—43. Surrounding of mouth on left side black . . . . . *A. melanorhynchus* p. 180.
2. D. 54. A. 36. Surrounding of mouth on left side not black . . . . . *A. leucorhynchus* p. 181.

1. Achiroides melanorhynchus (Blkr.).

[Fig. 48, p. 180, fig. 49, p. 181].

Plagusia melanorhynchus Bleeker, Nat. Tijdschr. Ned. Indië I. 1850, p. 15.
Achiroides melanorhynchos Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 402. — Verh. Bat. Gen. XXIV. 1852, Pleuron. p. 19.
Eurypleura melanorhyncha Kaup, Arch. Naturgesch. XXIV. 1858, p. 100.
Synaptura melanorhyncha Günther, Cat. Brit. Mus. IV. 1862, p. 487.
Achiroides melanorhynchus Bleeker, Atl. ichth. VI. 1866—1872, p. 26.
Synaptura melanorhyncha Volz, Zool. Jahrb. Abth. Syst. XIX. 1903, p. 380.
Synaptura achira Duncker, Mitth. Naturh. Mus. Hamburg XXI. 1904, p. 168 (s. syn.).

D. 56—61; A. 40—43; V. 3—5; L.l. circa 54.

Height 1.8—2.1, 2.5—2.9 in length with caudal. Head 3.3—3.4, 4—4.2 in length with caudal. Eyes about 7, rather prominent, the upper one somewhat in advance of the lower one, separated by a scaly interspace, which is less than one eye-diameter. Corner of mouth below frontborder of lower eye, twice nearer to end of snout than to branchial opening. Ventrals equal to snout. Scales feebly ctenoid on coloured side, still more feebly on blind side, where they are replaced round the mouth by fleshy filaments. Colour of preserved specimens reddish brown on coloured side, with black blotches loosely arranged into larger patches, which are situated along lateral line and along base of dorsal and anal. Blind side yellowish, with the surroundings of mouth black. Length 116 mm.

Fig. 49. Head of *Achiroides melanorhynchus* (Blkr.). × $^{10}/_{11}$.

Habitat: Singapore; Sumatra (Palembang); Borneo (Sintang!, Bunut!, Banjermassin, river Mahakam). — Malay Peninsula and Cambodja.

In fresh and brackish water.

2. Achiroides leucorhynchus Blkr.

Achiroides leucorhynchos Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 411. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 20.
Eurypleura leucorhyncha Kaup, Arch. f. Naturgesch. XXIV. 1858, p. 100.
Synaptura leucorhyncha Günther, Cat. Brit. Mus. IV. 1862, p. 486.
Achiroides leucorhynchus Bleeker, Atl. ichth. VI. 1866—1872, p. 26.

D. 54; A. 36; V. 3—4; L.l. about 60.

Height about 2, head about 4.5 in total length. Eyes 5—6, the upper one in advance of lower one. Interorbital space scaly, less than one eye-diameter. Corner of mouth below frontborder of eye. Scales ctenoid on both sides. Colour brownish, with diffuse irregular dark blotches. Left side whitish. Length 58 mm. [After BLEEKER, not seen by us].

Habitat: This species is only known from the specimens described by BLEEKER and caught in the river near Surakarta, Java.

8. Paraplagusia Bleeker.

(Bleeker, Atl. ichth. VI. 1866—1872, p. 26).
Plagusia (Cuvier, Kaup) Günther, Cat. Brit. Mus. IV. 1862, p. 491 (preoccupied).

Lanceolate. Eyes on left side. Scales ctenoid on both sides. Two or three lateral lines on coloured side, connected with each other by means of the sensory canal of the head, one median and one other along base of dorsal, the third one, if present, along base of anal. One lateral line on blind side, without pores. One tubular nostril on coloured side, with a valve at its free border; on blind side two nostrils, close behind each other; the anterior one pierced through a fleshy tentacle, the posterior one oval, with a short tube. Mouth unsymmetrical, strongly curved, the snout being hooked and overhanging the mouthopening. Lips of coloured side with a row of fringed tentacles. Dorsal, anal and caudal confluent. Pectorals absent. Only the left ventral is developed, it is connected with the anal. Gillmembranes united, more or less free from isthmus.

Distribution: Indic and West Pacific. In sea.

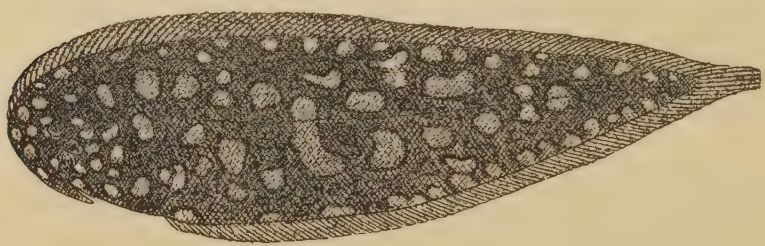

Fig. 50. *Paraplagusia bilineata* (Bl.) × 5/4.

Key to the indo-australian species of Paraplagusia.

I. Two lateral lines on coloured side.
  A. Hook of upper jaw reaching beyond vertical through hindborder of eye. 16—18 scales between lateral lines . . . . . *P. bilineata* p. 183.
  B. Hook of upper jaw not quite reaching to hindborder of eye. 14—16 scales between lateral lines.
    1. Height 3.6—3.7 in length with caudal . . . . *P. blochi* p. 184.
    2. Height 5 in length with caudal . . . . . *P. macrocephalus* p. 184.
II. Three lateral lines on coloured side . . . . . *P. guttata* p. 185.

1. **Paraplagusia bilineata** (Bl.) [Fig. 50, p. 182, fig. 51, p. 183].

Pleuronectes bilineatus Bloch, Ausländische Fische III. 1784, p. 29.
? *Plagusia dipterygia* Rüppell, Atl. N. Africa, Fische 1826—1831, p. 123.
Plagusia marmorata Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 411. — Verh. Bat. Gen. XXIV. 1852, Pleuronecteoiden p. 20.
Plagusia marmorata Günther, Cat. Brit. Mus. IV. 1862, p. 491.
Plagusia marmorata Kner, Novara Exp. I. 1865—1867, p. 293.
Paraplagusia marmorata Bleeker, Atl. ichth. VI. 1866—1872, p. 28.
Plagusia bilineata Klunzinger, Verh. zool. bot. Ges. Wien Bd. XXI. 1871, p. 573.
Plagnsia marmorata Day, Fishes of India 4°, 1878—1888, p. 431.
Paraplagusia marmorata Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII. 1905, p. 517.
Plagusia marmorata Günther, Fische der Südsee, Heft VIII. 1909, p. 348.
Paraplagusia marmorata Tate Regan, Ann. Durban Mus. vol. II. part 5, 1920, p. 219.

D. 96—119; A. 75—90; L.l. 90—106.

Height 3.3—3.5, 3.6—3.9 in length with caudal. Head 3.9—4.3, 4—4.6 in length with caudal. Eyes 10 or more, the upper one well in advance of lower one, separated by a scaly interspace which is one half to almost one eyediameter. Corner of mouth below hindborder of lower eye, much nearer to branchial opening than to end of snout. Hook of upper jaw extending farther than vertical through hindborder of lower eye, generally very much so. Scales ctenoid on both sides. Two lateral lines on coloured side, separated by 16—18 scales. Colour of alcohol specimens on the left side brownish, freckled with darker pigmentation forming a pattern of wavy and anastomosing lines, between which large more or less regularly arranged lighter round blotches are visible. In some preserved specimens the markings are inconspicuous and the fish is uniform brown. Right side yellowish or pinkish. Length 250 mm.

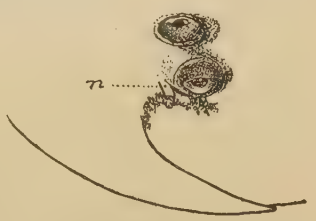

Fig. 51. Head of *Paraplagusia bilineata* (Bl.) × 5/4.

Nom. indig. Lida (Malay Batavia), Sablah (Menado).

Habitat: Pulu Weh!; Singapore; Sumatra (Padang); Batu Islands; Nias!; Borneo (Balik papan!); Java (Batavia); Madura!; Bali; Celebes (Menado!, Kema, Tombariri); Batjan; Amboina. — From Natal, Madagascar and Red Sea to British India and Japan, eastwards to Neu-Pommern.

Note. KLUNZINGER (l. c.) examined BLOCH's type and was able to ascertain that it is the same species described by

BLEEKER and GÜNTHER as *marmoratus*. The species called *bilineatus* by these and most other authors has therefore to be called *blochi*. It seems that all authors, excepting VON MARTENS, have overlooked KLUNZINGERS statement.

2. Paraplagusia blochi (Blkr.).

Plagusia bilineata Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1209 (nec Bloch).
Plagusia Blochii Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 411. — Verh. Bat. Gen. XXIV. Pleuronecteoiden 1852, p. 21.
Plagusia bilineata Günther, Cat. Brit. Mus. IV. 1862, p. 492 (nec Bloch).
Paraplagusia bilineata Bleeker, Atl. ichth. VI. 1866—1872, p. 27.
Plagusia Blochii von Martens, Preuss. Exp. nach Ost-Asien Bd. I. 1876, p. 398.
Plagusia bilineata Day, Fishes of India 4°, 1878—1888, p. 431 (nec Bloch).

D. 90—109; A. 74—80; L.l. 84—100.

Height 3.2—3.3, 3.6—3.7 in length with caudal. Head 3.5—3.8, 4—4.4 in length with caudal. Eyes 10—14, the upper one much in advance of lower one, separated by a scaly interspace which is about equal to one eye-diameter. Corner of mouth below hindborder of lower eye, much nearer to branchial opening than to end of snout. Hook of upper jaw not quite extending to vertical through lower eye. Scales ctenoid on both sides. Two lateral lines on coloured side, separated by 15—16 scales [1]). Colour of alcohol specimens brownish, with narrow dark longitudinal stripes, corresponding to the rows of scales. Length 230 mm.

Nomen indig. Lida lemper (Malay Batavia); Lattilat, Lindroh (Javanese), Nila (Madurese).

Habitat: Nias; Singapore; Sumatra (Benkulen, Trussan); Simalur!; Banka; Java (Batavia!, Cheribon, Tegal, Tjilatjap, Semarang, Rembang, Prigi, Surabaya, Pasuruan); Madura!; Borneo; Amboina. — From Madagascar and British India to Formosa.

In sea.

3. Paraplagusia macrocephalus Blkr.

Paraplagusia macrocephalus Bleeker, Atl. ichth. VI. 1866—1872, p. 28.

D. circa 109; A. circa 78; V. 4; L.l. about 95.

Height about 5, head 3.6 in length with caudal. Eyes 10,

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1) 13 according to BLEEKER, but in a specimen of his collection we count 15 scales between the lateral lines.

less than one eye-diameter apart. Corner of mouth below lower eye, twice as near to branchial opening as to snout. Hook of snout reaching to below lower eye. Scales ctenoid on both sides. Two lateral lines on coloured side, separated by about 14 scales. Colour of alcohol specimen olive, whitish on blind side. Length of single specimen known 84 mm. [After BLEEKER, not seen by us].

Habitat: Sumatra (Padang). In sea.

Note. The specimen described by BLEEKER under this name is possibly a young individual of *P. blochi.*

4. **Paraplagusia guttata** Macleay.

Plagusia guttata Macleay, Proc. Linn. Soc. N. South Wales II. 1878, p. 362. — Descr. Cat. Austr. Fish. II. 1881, p. 137.
Plagusia japonica Klunzinger, Sitzber. Akad. Wien LXXX. 1880, p. 409.
Plagusia notata De Vis, Proc. Linn. Soc. N. S. Wales VIII. 1883, p. 288.
Symphurus vittatus M. Weber, Nova Guinea V. Livr. 2, 1908, p. 250.
Rhinoplagusia australis Rendahl, Nyt Mag. f. Naturv. LX. 1922, p. 190.
Rhinoplagusia japonica Mc Culloch & Whitley, Rec. Austr. Mus. XIV. N°. 4, 1925, p. 350.

D. 104—118; A. 83—90; V. 4; L.l. about 100.

Height 3.6, 4 in length with caudal. Head 3.8, 4.2 in length with caudal. Eyes 10, the upper one somewhat in advance of the lower one, separated by a scaly interspace equal to half diameter of eye. Corner of mouth below hindborder of lower eye, nearer to branchial opening than to end of snout. Hook of snout reaching to vertical through hindborder of eye. Ten conical tentacles on upper lip, 8 similar ones on lower lip. Scales ctenoid on both sides, with the exception of the anterior ones on the blind side. The median lateral line is separated by 17 rows of scales from the superior and from the inferior one. Colour of alcohol specimen brown, lighter on right side. On left side a dark stripe along each longitudinal row of scales. Length of the specimen described (the type of *S. vittatus* and the only specimen known from our region) 90 mm. The species can attain a length of 280 mm.

Habitat: New Guinea (Mouth of Merauke river!). — Coast of North Australia.

Note. This species has generally been united with *P. japonica* Schlegel. But it differs from that species by the scales being

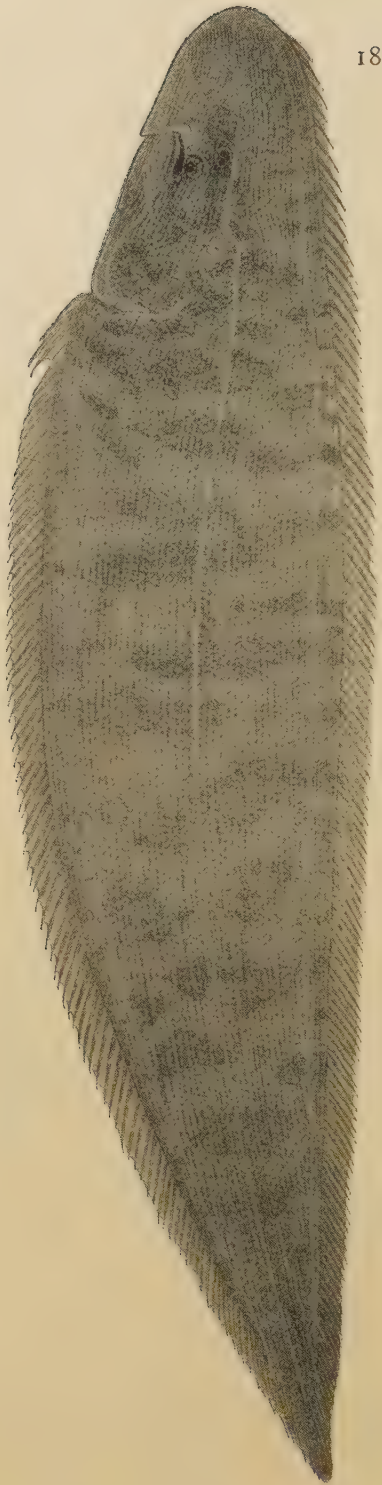

Fig. 52. *Cynoglossus heterolepis* M. Web. about n.s.

ctenoid on both sides, while in the japanese species, as far as we can make out by the descriptions of the various authors, the blind side has cycloid scales [1]).

We have chosen the name *guttata* Macleay, on the authority of Mc CULLOCH & WHITLEY who had the opportunity of reinvestigate the specimens of MACLEAY.

9. Cynoglossus Hamilton Buchanan.

(HAMILTON BUCHANAN, Fishes of the Ganges, 1822, p. 32).

Lanceolate. Eyes on the left side. Scales ctenoid on coloured side, ctenoid or cycloid on blind side. Two or three lateral lines on coloured side, connected with each other by means of the sensory canals of the head, one median and one running at some distance along base of dorsal always present, the third, along anal, present or absent. On the blind side two lateral lines, one, or no lateral line at all, generally not piercing the scales. On coloured side the anterior nostril is tubular, the posterior, when present, generally a

1) NORMAN. (Biol. Results „Endeavour". Fisheries Australia. Vol. V. Prt. 5. 1926, p. 300), came to the same result, after comparing australian and japanese specimens.

simple opening in interorbital space; on blind side the anterior nostril is generally also tubular, the posterior an opening or slit, but they are less conspicuous than on the coloured side. Mouth unsymmetrical, strongly curved, the snout hooked and overhanging the mouthopening. Lips not fringed. Dorsal, anal and caudal confluent. Pectorals absent, only the left ventral is developed, it is connected with the anal. Gillmembranes united, more or less free from isthmus.

Distribution: Indic, West Pacific and East Atlantic. Tropical and subtropical. Some species living in fresh water.

Key to the indo-australian species of Cynoglossus.

I. Three lateral lines on coloured side.
- *A.* Corner of mouth nearer to end of snout than to branchial opening.
  - *a.* Ll. 55. Nine scales between upper and median lateral line . . . . . *C. Kopsi* p. 189.
  - *b.* L.l. 86—97, 23—26 scales between upper and median lateral line . . . . . *C. waandersi* p. 189.
- *B.* Corner of mouth nearer to branchial opening than to end of snout.
  - *a.* L.l. 132—150. 21—22 scales between upper and median lateral line. . . . . *C. microlepis* p. 190.
  - *b.* L.l. 110—126.
    1. 15—17 scales between upper and median lateral line . . . . . *C. heterolepis* p. 191.
    2. 20—24 scales between upper and median lateral line.
       - *α.* Horizontal part of cleft of mouth shorter than the vertical part. L.l. 110—120 . . *C. feldmanni* p. 192.
       - *β.* Horizontal part of cleft of mouth longer than the vertical part. L. l. 126 . . . . *C. xiphoideus* p. 193.

II. Two lateral lines on coloured side.
- *A.* Two lateral lines also on blind side.
  - *a.* Posterior nostril of coloured side in interorbital space. The anterior one near upper lip, tubular.
    1. 15—16 scales between lateral lines. L.l. 86—98. . . . . *C. bilineatus* p. 194.
    2. 8—9 scales between lateral lines. L. l. about 75. . . . . *C. kaupi* p. 196.

b. Both nostrils of coloured side above upper lip, before lower eye. L.l. 70. 7—8 scales between lateral lines . . . . . *C. cantoris* p. 196.

B. One more or less distinct lateral line on blind side or no lateral line at all at that side.

a. Two nostrils on coloured side before eyes, which are prominent, almost stalked and subcontiguous . . . . . *C. monopus* p. 197.

b. Two nostrils on coloured side, the posterior one in interorbital space.

1. Scales ctenoid on both sides.

α. Corner of mouth nearer to end of snout than to branchial opening.

α'. 15—18 scales between lateral lines.

α''. L.l. 89—97. Eyes 8—10 in head, less than one eyediameter apart. . *C. puncticeps* p. 198.

β''. L.l. 105; eyes 15 in head, close together . . . . . *C. cynoglossus* p. 199.

β'. 10 scales between lateral lines. L.l. 60. *C. sibogae* p. 200.

β. Corner of mouth midway between snout and branchial opening . . . . . *C. oxyrhynchus* p. 201.

γ. Corner of mouth nearer to branchial opening than to end of snout.

α'. L.l. 65—70.

a'. 8 scales between lateral lines . . . *C. polytaenia* p. 201.

b'. 11—12 scales between lateral lines. *C. sumatranus* p. 202.

β'. L.l. about 90. 13—14 scales between lateral lines . . . . . *C. lida* p. 203.

2. Scales cycloid on blind side.

α. L.l. 81 to about 100.

a. 12—13 scales between lateral lines. Corner of mouth nearer to branchial opening than to end of snout . . . . . *C. lingua* p. 203.

b. 19—20 scales between lateral lines. Corner of mouth midway between end of snout and branchial opening . . . . *C. borneensis* p. 205.

β. L.l. 48—65.

a. 6—7 scales between lateral lines. Corner of mouth midway between end of snout and branchial opening . . . . . *C. macrolepidotus* p. 205.

b. 8—9 scales between lateral lines. Corner of mouth nearer to branchial opening than to end of snout . . . . . *C. oligolepis* p. 206.

C. One nostril on coloured side. Eyes close together.

1. Height 3.3, head 4.7—5. Eight to ten scales between lateral lines . . . . . *C. brachycephalus* p. 207.

2. Height about 6, head 5.3. Six scales between lateral lines . . . . . *C. grandisquamis* p. 208.

Doubtful species. . . . . *C. macrorhynchus* p. 208.

1. Cynoglossus kopsi (Blkr.).

Plagusia Kopsii Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 494 et VII. 1854, p. 99. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 31.

Arelia Kopsi Bleeker, Act. Soc. Scient. Ind. neerl. VI. 1859, Enum. spec. pisc. Arch. Indico p. 184.

Cynoglossus kopsii Günther, Cat. Brit. Mus. IV. 1862, p. 493.

Cynoglossus Kopsii Bleeker, Atl. ichth. VI. 1866—1872, p. 31.

D. 101—102; A. 76—79; V. 4; L.l. 55.

Elongate. Height 3.5, about 4 in length with caudal, head 4.5, 5 in length with caudal. Eyes subcontiguous, about 7, the superior somewhat in advance of the inferior one, which is situated above corner of mouth. On coloured side the anterior nostril is tubular and situated near upper lip, the posterior one is an opening immediately in front of interorbital space. Corner of mouth nearer to end of snout than to branchial opening. Hook of upper jaw not quite reaching to below eye. Scales ctenoid on both sides. Three lateral lines on left side, one on right side. Seven [1]) to nine scales between upper and middle lateral line. Colour of left side grayish-green, body and fins with numerous oblong brown spots. Length 140 mm.

Nom. indig.: Lida-lida. (Malay).

Habitat: Singapore; Sumatra (Priaman); Bintang; Java-sea!; Amboina; Arafura-sea. — Indian Ocean.

In sea.

2. Cynoglossus waandersi (Blkr.).

Plagusia Waandersi Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 98.

Arelia waandersi Bleeker, Enum. spec. piscium. Act. Soc. Indo-Neerl. VI. 1859, p. 185.

Cynoglossus waandersi Bleeker, Atl. ichth. VI. 1866—1872, p. 31.

D. 84—92; A. 62—69; V. 4; L.l. 86—97.

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1) We have only seen one specimen of this species, the scales are partly rubbed off and we are therefore not sure about the number of scales between the upper and middle lateral line.

Elongate. Height 2.9—3, 3.3—3.6 in length with caudal. Head 4—4.2, 4.4—4.7 in length with caudal. Eyes 14—15, the upper one somewhat before the lower one, much nearer to end of snout than to branchial opening. On coloured side one nostril is tubular and situated on upper lip, before lower eye, the other one is pierced through interorbital space, which is scaly and equal to or twice as long (in larger specimens) as diameter of eye. On the blind side the nostrils are situated obliquely behind each other, the anterior one is tubular, the posterior one a slit. Corner of mouth below posterior half of eye, much nearer to snout than to branchial opening. Hook of upper jaw not reaching to below eye. Dorsal beginning on snout somewhat above horizontal through upper eye. All fin-rays simple, without scaly covering. Scales ctenoid on both sides or partly cycloid on blind side in large specimens; the scales of anterior part of head and body smaller than those of posterior part. Three lateral lines on coloured side. Twenty three to twenty six scales between upper and middle lateral line. On the blind side three very indistinct lateral lines. Colour of alcohol specimens yellowish brown or reddish brown, freckled with darker in small specimens and with larger dark patches, which in large specimens are only visible along the base of the fins. Fins with oblique dark streaks. Length almost 300 mm.

Habitat: Sumatra (Batang Hari!, Lematang Enim, Taluk!, Gunung Sahilan!); Borneo (Bunut!). — In rivers.

3. Cynoglossus microlepis (Blkr.).

Plagusia microlepis Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 413. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 31.
Arelia microlepis Bleeker, Act. Soc. Scient. Indo-neerl. VI. 1859, Enum. spec. pisc. p. 184.
Cynoglossus microlepis Günther, Cat. Brit. Mus. IV. 1862, p. 495.
Cynoglossus microlepis Bleeker, Atl. ichth. VI. 1866—1872, p. 32.
Cynoglossus microlepis Vaillant, Nouv. Arch. Mus. Hist. Nat. (4) V. 1893, p. 101.

D. 112—123; A. 93—97; V. 4; L.l. 132—150.

Very elongate. Height 4.2—5, head 5.2—5.7. Eye 11—14, superior one somewhat in advance of inferior one. On coloured side the anterior nostril is tubular and situated near upper lip, the posterior one is an opening in the interorbital space, which is one eyediameter or somewhat less. Corner of mouth below or behind eyes, nearer to branchial opening than to

end of snout. Hook of upper jaw reaching to beyond vertical through hindborder of lower eye. Scales ctenoid on both sides. Three lateral lines on left side, one on right side. Twenty one or twenty two scales between upper and middle lateral line, 23—24 between middle and lower one. Colour of alcohol specimens reddish, with dark cloudy spots, which are more or less regularly arranged. Length 356 mm.

Habitat: Sumatra (Djambi!); Borneo (Sungiduri, Sampit, Knapei, Sebruang, Banjermassin).

In rivers.

4. **Cynoglossus heterolepis** M. Web.

[Fig. 52, p. 186, fig. 53, p. 191].

Cynoglossus heterolepis M. Weber, Notes Leyden Museum XXXII. 1910, p. 237. — Nova Guinea IX. Livr. 4, 1913, p. 590.

D. 110—115; A. 85; V. 4; Ll. 114—125.

Elongate, snout long and rounded in front. Height 3.9—5.1, 4.2—5.5 in length with caudal. Head 4.2—5, 4.5—5.2 in

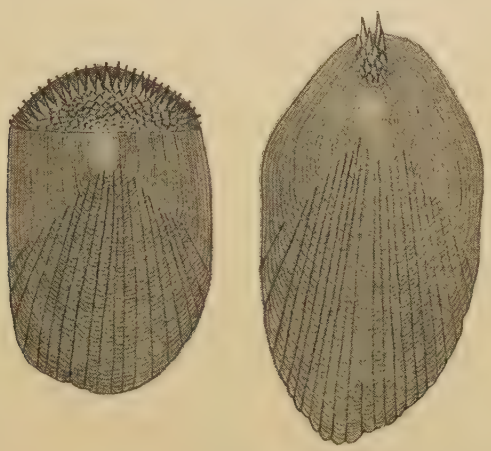

Fig. 53. Scales of *Cynoglossus heterolepis* M. Web.
The left scale from the left, the right scale from the right side of the body × 15.

length with caudal. Eyes small, 16—17, the upper one is one half eyediameter in front of the lower one. Interorbital space about one half eyediameter, pierced by the posterior nostril; the anterior one tubular, near upper lip. Two nostrils at some distance of each other above middle of mouth on blind side, the anterior one is tubular. Corner of mouth behind or below

lower eye, much nearer to branchial opening than to end of snout. Horizontal part of mouth slightly shorter than the vertical. Scales ctenoid, those of blind side with a few spines only. Three lateral lines on coloured side, the upper and middle one separated by 15—17 scales. On the blind side one lateral line, without perforations of the scales. Colour of alcohol specimens brown, with a varying number of dark crossbands, generally much narrower than the interspaces, in which generally rows of dark patches or incomplete crossbands are visible. This designs can be almost absent, in other cases the crossbands are quite irregular. Commonly the coloured side shows fine dark longitudinal stripes, according with the rows of scales. Length 235 mm.

Habitat: New Guinea (Lorentz-river!). In fresh water.

5. Cynoglossus feldmanni (Blkr.).

Plagusia Feldmanni Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 455.
Arelia Feldmanni Bleeker, Enumeratio specierum piscium etc. Act. Soc. Sc. Indo-Neerl. VI. 1859, p. 184.
Cynoglossus feldmanni Günther, Cat. Brit. Mus. IV. 1862, p. 494.
Cynoglossus Feldmanni Bleeker, Atl. ichth. VI. 1866—1872, p. 31.
? *Cynoglossus kapuasensis* Fowler, Proc. Acad. Nat. Sc. Philadelphia LVII. 1905, p. 519.
Cynoglossus kapwasensis Seale, Philip. Journ. Sci. V. 1910, p. 288 (misprint for *kapuasensis*).

D. 104—110; A. 78—94; V. 4; L.l. 110—120.

Very elongate. Height 4—4.6, 4.5—5 in length with caudal. Head 4.7—5.5, 5.4—5.7 in length with caudal. Eyes small, about 10, upper eye somewhat in advance of lower one and midway between point of snout and border of operculum. On coloured side one nostril is tubular and situated on upper lip, before anterior eye; the other one is an opening in interorbital space, which is scaly and less than one eyediameter. On blind side the nostrils are situated behind each other, above posterior part of mouth; the anterior one is tubular. Corner of mouth below posterior border of eye, nearer to branchial opening than to point of snout. Horizontal part of cleft of mouth shorter than the vertical part. Hook of upper jaw reaching to below eyes. Dorsal beginning on snout, somewhat above horizontal through upper eye. All finrays simple, without scaly covering. Scales ctenoid on coloured side, partly ctenoid and partly cycloid on blind side; the scales of ante-

rior part of body and of head smaller than those of posterior part of body. Three lateral lines on coloured side of body. Twenty to twenty four scales between upper and middle lateral line. On the blind side there are also three less distinct lateral lines. Colour of alcohol specimens reddish brown on coloured side, freckled with darker spots and with large irregular dark patches or rings, more or less arranged in three longitudinal rows on lateral lines, the middle ones larger than the others. Fins with dark spots. Length 237 mm.

Habitat: Sumatra (Batang Hari!, Palembang); Borneo (Pengaron, Knapei, Sebruang, Sandakan?). — In rivers.

Note. *C. kapuasensis* described by FOWLER from the Kapuas river and mentioned by SEALE from Sandakan may be a different species. The only example described is somewhat less elongate (height 3.8) and has the „dextral side with a broad fleshy labial fold finely or minutely fringed" which we do not see in our specimens of *C. feldmanni*. As those minute structures are often unconspicuous in preserved specimens, we do not think it necessary to separate the two species, which otherwise agree in every respect, till more material is available.

6. Cynoglossus xiphoideus Gthr.

Cynoglossus xiphoideus Günther, Cat. Brit. Mus. IV. 1862, p. 495.
Cynoglossus xiphoideus Kner, Novara Exp. Fische, 1865—1867, p. 294.
Cynoglossus xiphoideus Edwards, Bull. Nouv. Arch du Museum II, 1866, p. 13.
Cynoglossus xiphoideus M. Weber, Siboga-Exp. Fische, 1913, p. 441.
Cynoglossus xiphoideus S. L. Hora, Journ. Nat. Hist. Soc. Siam VI. 1923, p. 182.

D. 118; A. 101; V. 4; L.l. 126.

Elongate, dorsal profile evenly curved, ventral profile more convex in its anterior half and tapering to the end of the tail in a straight line posteriorly. Snout rather pointed. Height 4, 4.3 in length of caudal. Head 4.5, 4.8 in length with caudal. Eyes about 11, sunken, covered by scaly eyelids, less than one eyediameter apart. The upper one slightly before the lower one. Anterior nostril tubular, near upper lip, posterior one in anterior part of interorbital space. On blind side the two nostrils are at a short distance of each other, above middle of snout; the anterior is a narrow tube, the posterior a very wide one. The horizontal part of the curved mouthopening is longer than the vertical part. Angle of mouth not quite reaching to below

vertical through hindborder of lower eye, nearer to branchial opening than to point of snout. Hook of upper jaw not reaching vertical through frontborder of upper eye. Scales ctenoid on both sides, those of anterior part of body smaller than the others. Three lateral lines on coloured side. Twenty scales between upper and middle one. On the blind side three indistinct lateral lines, which do not perforate the scales. Colour of alcohol specimen light yellowish, scarcely lighter on blind side. Length 232 mm.

Habitat: Timor-sea, 216 M. Sand!. — Siam, China (KAROLI).

Note. We made the above description after the specimen of the Siboga Expedition from the Timor-sea, mentioned by one of us l.c., who stated already that there are some differences between GÜNTHER's type-specimen and this one. In the type the eyes are separated by more than one eye-diameter and the upper one is considerably in advance of the lower; also the height is less, $4^2/_3$ times in length with caudal and the head is shorter, $5^1/_2$ times in length with caudal. Therefore we are not sure that our specimen really is the same as *C. xiphoideus* and thought it therefore better to give a description of this specimen only.

The specimen of KNER, from „East-India", seems to have smaller scales (L.l. 140), but, as it is difficult to state, where the linea lateralis crosses the boundary between head and body in these fishes and as some authors therefore count the scales of the lateral line from its ramification on the head, not too great stress can be laid on this difference.

7. Cynoglossus bilineatus (Lac.).

Achirus bilineatus Lacépède, Hist. Nat. Poissons v. 1803, p. 6.
Plagusia bilineata Rüppell, Atlas Reise N. Afrika 1826—1831, p. 120.
Plagusia quadrilineata Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 412. — Verh. Bat. Gen. XXIV. Pleuronect. 1852, p. 21.
Arelia quadrilineata Kaup, Arch. f. Naturgeschichte 1858, p. 107.
Cynoglossus quadrilineatus Günther, Cat. Brit. Mus. IV. 1862, p. 497.
Cynoglossus quadrilineatus Kner, Novara Exp. Fische, 3. Abth. I. 1867, p. 295 [1]).
Cynoglossus quadrilineatus Bleeker, Atl. ichth. VI. 1866—1872, p. 32.
Cynoglossus quadrilineatus Klunzinger, Verhandl. zool.-bot. Ges. Wien XXI. 1871, p. 573.
Cynoglossus quadrilineatus Macleay, Proc. Linn. Soc. N. S. Wales IX. 1884, p. 53

1) KNER records two ventrals, but otherwise his description is in accordance with those of other authors.

Cynoglossus quadrilineatus Day, Fishes of India 4° 1878—1888, p. 435.
Cynoglossus quadrilineatus Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 288.
Cynoglossus quadrilineatus Steindachner, Denkschr. Akad. Wien LXXI. 1902, p. 154.
Cynoglossus quadrilineatus Smith & Pope, Proc. U.S. Nat. Mus. XXXI. 1906, p. 498.
Cynoglossus bilineatus M. Weber, Siboga-Exp. Fische, 1913, p. 443.
Cynoglossus bilineatus Norman, Biol. Results „Endeavour". Fisheries Australia vol. V. Part 5. 1926. p. 301.

D. 102—112; A. 82—97; V. sin. 4; L.l. [1]) 86—98; L. tr. $\frac{7—8}{1}\,\frac{13—16}{1}\,\frac{}{23—25}$.

Elongate. Height 3.4—4.3, head 4—4.4 in length without caudal. Eyes 9—10, the hindborder of the upper one almost or quite above the middle of the lower one, more than one eyediameter nearer to end of snout than to branchial opening. On coloured side one nostril is tubular and situated on upper lip, before lower eye, the other one is pierced through interorbital space, which is scaly and slightly less than eye. On the blind side the two nostrils are placed at some distance of each other above the upper curvature of the mouth; the anterior one is tubular, the posterior one with a more or less distinct semilunar rim. Corner of mouth nearer to branchial opening than to snout, situated somewhat behind hindmargin of lower eye. Hook of upper jaw somewhat more or less than one eye-diameter before vertical through frontborder of eye. Dorsal beginning near end of snout. All finrays simple, without scaly covering. Scales ctenoid on coloured side, cycloid on blind side. Scales of head, of body immediately behind branchial opening and along base of dorsal and anal, smaller than the rest. On blind side of head the scales are transformed into papillae. Two lateral lines on coloured side, the upper one separated by 7—8 scales from base of dorsal and by 15—16 from middle lateral line, which has 23—25 scales between it and base of anal. Two lateral lines, a superior and a middle one, on blind side. Colour of alcohol specimens brownish, with an irregular dark blotch on operculum. Fins dusky with a white border. Length 300 mm.

Nom. indig.: Lida lumpur (Malay Batavia); Latjileh lorah (Madura).

Habitat: Singapore; Malacca Strait!; Riouw; Bintang;

1) Perforated scales counted from vertical through gillopening.

Banka; Sumatra (Deli!, Padang); Borneo (Sinkawang, Balikpapan!); Java! (Batavia!, Cheribon!, Tjilatjap, Samarang, Rembang!, Surabaya, Pasuruan); Madura!; Celebes (Makassar!); Flores!; Ambon. — From coast of Zansibar and Red Sea, along Asiatic coast of Indic to Philippines, Japan and eastwards to Australia (Queensland). — In sea.

8. Cynoglossus kaupi (Blkr.).

Arelia kaupii Bleeker, Act. Soc. Scient. Indo-neerl. VIII. 1860, Achtste Bijdr. vischfauna Sumatra, p. 73.
Cynoglossus kaupi Bleeker, Atl. ichth. VI. 1866—1872, p. 32.

D. 107; A. 82; V. 4; L.l. about 75.

Elongate. Height about 4.5, head about 4.3. Eyes about 13, the upper one somewhat in advance of the lower one. On coloured side a tubular anterior nostril near upper lip, shortly before lower eye, and a posterior one pierced through interorbital space, which is about one eyediameter. On blind side the nostrils are situated at some distance behind each other above the mouth; the anterior one is tubular. Corner of mouth slightly nearer to branchial opening than to end of snout. Hook of upper jaw before vertical through frontmargin of upper eye. Dorsal beginning at a short distance from end of snout. Scales ctenoid on left side, excepting those of the middle of posterior part of body, which are cycloid as those of right side. The scales of the head on this side are transformed into fringed papillae. Two lateral lines on both sides, those of left side separated by 8 or 9 scales. Colour of left side greenish, with numerous darker longitudinal bands, white on right side. Fins yellowish. Length of single specimen known 255 mm. [After BLEEKER, not seen by us].

Habitat: Sumatra (Benkulen). In sea.

9. Cynoglossus cantoris (Blkr.).

Plagusia potous Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1217 (nec Cuv.).
Plagusia cantoris Bleeker, Verh. Bat. Gen. XXV. 1853, Nalezingen ichthyol. fauna Bengalen en Hindustan, p. 76, p. 153 footnote.
Cantoria pinangensis Kaup, Arch. f. Naturgesch. XXIV. 1, 1858, p. 106.
Cynoglossus cantoris Günther, Cat. Brit. Mus. IV. 1862, p. 502.
Cynoglossus cantoris Bleeker, Atl. ichth. VI. 1866—1872, p. 33.

D. 126—127; A. 94—95; V. 4; L.l. 70.

Height 5.5, head 5.3. Eyes 11, the upper one scarcely in

advance of the lower one. Interorbital space equal to one eye-diameter. Two nostrils, one of which is very small, above the upper lip, in front of the lower eye. The rostral hook just covers the symphysis of the mandibles. Scales of coloured side ctenoid. Two lateral lines on each side, separated in the middle by seven or eight longitudinal series of scales. Copper red, opercules blackish, fins minutely dotted with brown. Length 350 mm.

Habitat: Singapore. — Pinang.

Note. BLEEKER (l. supra c. p. 76) cites this species in his list of fishes from Hindustan but, where he refers to this species in later papers, he does not mention this locality anymore.

10. **Cynoglossus monopus** (Blkr.).

Plagusia monopus Bleeker, Verh. Bat. Gen. XXII. (1848) 1849, Bijdr. Ichth. Bali p. 11.
Plagusia melanopterus Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 415. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 25.
Arelia ceratophrys Kaup, Arch. f. Naturgeschichte XXIV. 1. 1858, p. 108.
Arelia melanopterus Bleeker, Act. Soc. Scient. Indo-Neerl. VI. 1859, p. 104.
Cynoglossus melanopterus Günther, Cat. Brit. Mus. IV. 1862, p. 502.
Cynoglossus monopus Bleeker, Atl. ichth. VI. 1866—1872, p. 38.
Cynoglossus melanopterus Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, part II. N° 3, p. 289.

D. 112—118; A. 86—96; V. 4; L.l. 104—112.

Very elongate, much tapering to the tail. Height 4.1—4.4, 4.5—4.8 in length. Head 4.3—5.2, 4.7—5.5 in length with caudal. Eyes 15—16, prominent, almost stalked, subcontiguous, the upper one in advance of the lower. Nostrils of coloured side close together in a horizontal line before the eyes, the anterior with a long tube, the posterior one with a shorter valve; those of blind side with a valve. Corner of mouth below or somewhat behind vertical through hindborder of lower eye, nearer to end of snout than to branchial opening. Hook of upper jaw short, not reaching below eyes. An upper and a median lateral line on coloured side, separated by 15 scales. One indistinct one on blind side. Scales ctenoid on both sides. Colour of preserved specimens light brownish, fins whitish with a black terminal border along their posterior half. Length 170 mm.

Nom. indig.: Lida (Malay), Lattilat (Sundan.).

Habitat: Sumatra (Priaman, Deli!, Bagan Api Api!); Java

(Batavia!, Bantam, Tjiringin, Pekalongan!, Surabaya); Madura; Bali; Borneo (Singkawang). — China, Bay of Bengal.

In sea.

11. Cynoglossus puncticeps (Rich.).

Plagusia puncticeps Richardson, Rep. 15th meeting British Assoc. 1846, p. 280.
Plagusia javanica Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 414 — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 24.
Plagusia brachyrhynchus Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 414. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 24.
Arelia javanica Bleeker, Act. Soc. Scient. Indo-Neerl. VI. 1859, Enum. spec. piscium Arch. Ind. p. 184.
Arelia brachyrhynchus Bleeker, ibid.
Cynoglossus brachyrhynchus Günther, Cat. Brit. Mus. IV. 1862, p. 499.
Cynoglossus puncticeps Günther, l. c. p. 500.
Cynoglossus puncticeps Kner, Novara Exp. Fische 1865—1867, p. 297.
Cynoglossus brachyrhynchus Bleeker, Atl. ichth. VI. 1866—1872, p. 37.
Cynoglossus puncticeps Bleeker, ibid.
Cynoglossus brachyrhynchus Day, Fishes of India 4°, 1878—1888, p. 435.
Cynoglossus puncticeps Day, l. c. p. 437.
Cynoglossus puncticeps Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 289.
Cynoglossus puncticeps Jordan & Seale, Bull. Bur. Fish. Washington XXVI. (1906) 1907, p. 46.
Cynoglossus brachyrhynchus M. Weber, Siboga-Exp. Fische 1913, p. 443.

D. 92—100; A. 70—77; V. 4; L.l. 89—97.

Height 3—3.5, 3.4—3.8 in length with caudal. Head 4.3—5, 4.8—5.4 in length with caudal. Eyes 8—10, less than one eyediameter apart, the upper one somewhat in advance of the lower one. Posterior nostril on coloured side pierced through interorbital space, anterior one tubular, near upper lip. Corner of mouth below middle or hindborder of lower eye, less than one eyediameter nearer to end of snout than to branchial opening. Scales ctenoid on both sides. An upper and a median lateral line on coloured side, separated by 15—18 scales. A single indistinct one on blind side. Colour of alcohol specimens reddish brown, with darker clouded spots, sometimes united into longitudinal irregular vertical crossbands and disappearing with age. Longitudinal rows of scales marked with fine longitudinal dark stripes. Some of the finrays marked with dark brown. Length 150 mm.

Nom. indig.: Lempa, Lida (Malay, Batavia); Lattilat (Sundan.).

Habitat: Singapore; Banka; Borneo; Java-sea!; Java (Batavia, Bantam, Anjer, Surabaya!, Pasuruan); Strait Madura 55 M.!;

Celebes (Makassar!, Menado); Flores!; Sumbawa 36 M.!; Ambon; Batjan; Aru-islands! — Philippines, Calcutta, Mulmein, Ceylon (Pearlbanks of Aripu).

In sea and brackish water.

Note. We have united *C. brachyrhynchus* with *C. puncticeps* which species according to BLEEKER differs only in the number of rows of scales between the lateral lines, which are 15—16 for *C. brachyrhynchus* and 17—18 for *C. puncticeps*. DAY mentions as a difference the position of the angle of the mouth, which is behind the eye in *C. brachyrhynchus*, below the eye in *C. puncticeps*; for the L. tr. DAY gives 17—18 for *C. brachyrhynchus* and 16—17 for *C. puncticeps*, thus just the other way round as BLEEKER.

In a specimen of *C. puncticeps* of BLEEKER's collection we find 17 scales between the lateral lines and the corner of the mouth below the hindborder of the lower eye, and in a specimen of *C. brachyrhynchus* of the same length, from the Siboga Expedition, 16 scales between the lateral lines and the corner of the mouth before the hindmargin of the eye. Therefore it would seem as if what DAY calls *C. brachyrhynchus* is the species which BLEEKER calls *C. puncticeps*, and DAY's *C. puncticeps* would be the same as BLEEKER's *C. brachyrhynchus*. Now GÜNTHER states of *C. puncticeps*: angle of the mouth below the middle of the eye (in accordance with DAY), and gives 17—18 as the number of scales between the lateral lines (in accordance with BLEEKER), wherefrom may be concluded, that the combination of the two characteristics mentioned is not constant. Therefore we unite these two species.

12. Cynoglossus cynoglossus (H. B.).

Achirus cynoglossus Hamilton Buchanan, Fishes Ganges, 1822, p. 132, 373.
Plagusia cynoglossa Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1211.
Icania cynoglossa Kaup, Arch. f. Naturgesch. XXIV, I. 1858, p. 109.
Cynoglossus hamiltonii Günther, Cat. Brit. Mus. IV. 1862, p. 504.
Cynoglossus hamiltonii Day, Fishes of India 4°, 1878—1888, p. 436.
Cynoglossus Hamiltonii Duncker, Mitth. Naturh. Mus. Hamburg XXI. 1904, p. 169.

D. 100—102; A. 76—78; V. 4; L.l. 105.

Height 4.2—4.3, head 5.2—5.3. Eyes 15, close together, the upper slightly in advance of the lower. Angle of mouth one eyediameter behind lower eye, and much nearer to snout than to gillopening. Two nostrils on coloured side, one between

the eyes and a second tubular one before the lower eye. Scales ctenoid on both sides. Two lateral lines on coloured side, divided by 15 to 16 scales. Reddishbrown, with irregular brownish black spots; sometimes a portion of the spots confluent into seven or eight cross-bands. Length 150 mm. [Not seen by us].

Habitat: Singapore (DUNCKER). — Pinang; Seas and estuaries of India; Ceylon (Pearlbanks of Aripu).

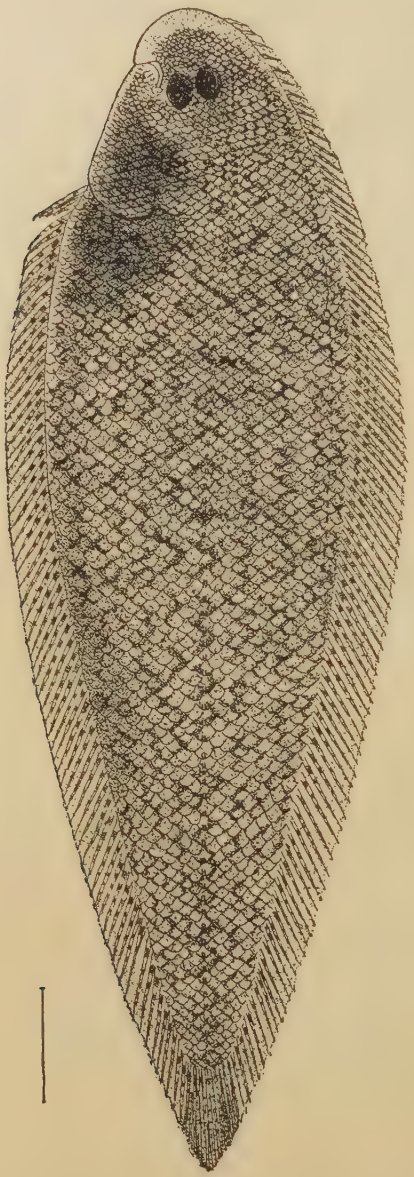

Fig. 54. *Cynoglossus sibogae* M. Web. × $1^1/_2$.

13. Cynoglossus sibogae M. Web. [Fig. 54].

Cynoglossus Sibogae M. Weber, Siboga-Exp. Fische 1913, p. 442.

D. 100; A. 75—80; V. 4; L.l. 60.

Height 3.5, 3.8 in length with caudal. Head 5, 5.3 in length with caudal. Eyes 5, subcontiguous, the upper one somewhat in advance of the lower one. Posterior nostril between eyes, anterior one near upper lip, tubular. Angle of mouth below middle of lower eye, nearer to end of snout than to branchial opening. Hook of upper jaw short, scarcely reaching to vertical through frontborder of upper eye. Scales ctenoid on both sides, increasing in size posteriorly. Two lateral lines on coloured side, an upper and a middle one, separated by 10 scales. No

conspicuous lateral line on blind side. Colour of alcohol specimens brown with darker irregular spots on the scales. Operculum and abdomen darker. Fins spotted with darkbrown. Length 77 mm.

Habitat: Molo-strait, 69—91 M.!; Lirung, island Salibabu, 30 M.!.

In sea.

14. Cynoglossus oxyrhynchus (Blkr.).

Plagusia oxyrhynchos Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 416. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 26.
Arelia oxyrhynchos Bleeker, Act. Soc. Scient. Indo-Neerl. VI. 1859, Enum. spec. piscium Arch. Ind. p. 185.
Cynoglossus oxyrhynchus Günther, Cat. Brit. Mus. IV. 1862, p. 499.
Cynoglossus oxyrhynchus Bleeker, Atl. ichth. VI. 1866—1872, p. 36.

D. 98—105; A. 77—84; V. 4; L.l. 80—90.

Height 3.5, 3.7—4.2 in length with caudal. Head 4.6, 5 in length with caudal. Eyes 12, close together, separated by one row of small scales, the upper considerably in advance of the lower. Posterior nostril on coloured side between the eyes, anterior one tubular, near upper lip. Corner of mouth below lower eye, midway between branchial opening and end of snout. Hook of upper jaw short, not reaching to below eyes. Scales ctenoid on both sides. On coloured side an upper and a median lateral line, separated by 12—13 scales; a single one on blind side. Colour of preserved specimen brown; blind side whitish. Length 120 mm.

Nom. indig.: Lida (Malay, Batavia).

Habitat: Java (Batavia); Borneo (Bandjermassin); Lombok!; Ambon.

In sea and rivers.

15. Cynoglossus polytaenia (Blkr.).

Plagusia polytaenia Bleeker, Nat. Tijdschr. Ned. Indië, 1853, p. 529.
Arelia polytaenia Bleeker, Act. Soc. Scient. Indo-Neerl. VI. 1859, Enum. spec. piscium Arch. Ind. p. 185.
Cynoglossus polytaenia Bleeker, Atl. ichth. VI. 1866—1872, p. 36.

D. 102—104; A. circa 79; V. 4; L. l. 65—70.

Height 3.7, 4.4 in length with caudal. Head 4.1, 5 in length with caudal. Eyes about 10, the upper one in advance of the lower one. Interorbital space less than eye, pierced by posterior

nostril, the anterior one tubular, near upper lip; those of blind side simple openings. Corner of mouth below lower eye, much nearer to branchial opening than to end of snout. Hook of upper jaw reaching to below eyes. Scales ctenoid on both sides. Two lateral lines on coloured side, an upper and a median one, separated by 8 scales. Coloured side with numerous longitudinal dark bands disappearing in preserved specimens. Blind side whitish. Length 115 mm.

Habitat: Singapore; Sumatra (Tiku, Priaman); Java (Batavia!); Ambon. — Pinang!.

In sea.

Note. GÜNTHER (Cat. Brit. Mus. IV. p. 498) examined a specimen of this species from BLEEKER's collection which had L.l. 85, and therefore united the species with *C. lida*. In the Atlas ichthyologique, which appeared after GÜNTHER's Catalogue vol. IV, BLEEKER maintained the distinction of his species. We have seen two specimens, one from Batavia and one from Pinang, which agree with BLEEKER's description.

16. **Cynoglossus sumatranus** (Blkr.).

Plagusia sumatrana Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 529.
Arelia sumatrana Bleeker, Act. Soc. Sc. Indo-Neerl. VI. 1859, Enum. spec. pisc. Arch. Ind. p. 185.
Cynoglossus sumatrensis Günther, Cat. Brit. Mus. IV. 1862, p. 497.
Cynoglossus sumatrensis Bleeker, Atl. ichth. VI. 1866—1872, p. 35.
Cynoglossus sumatrensis Jordan & Richardson, Bull. Bureau Fish. Wash. 1908, p. 281.

D. 104; A. 77; V. 4; L.l. about 70.

Height 4.3—4.5 in length with caudal. Head 4.5 [1]) in length with caudal. Eyes 12, less than one eyediameter apart, the upper one somewhat in advance of the lower one. Posterior nostril of coloured side pierced in interorbital space, anterior one tubular, near upper lip. Nostrils of blind side simple openings. Corner of mouth behind vertical through hindmargin of lower eye, nearer to branchial opening than to end of snout. Hook of lower jaw reaching to below eyes. Scales ctenoid on both sides. Two lateral lines on coloured side, an upper and a median one, separated by 11 or 12 scales. One indistinct lateral line on blind side. Colour greenish,

1) 5.5 according to GÜNTHER.

clouded with brownish. Length 121 mm. [After BLEEKER and GÜNTHER, not seen by us].

Habitat: Singapore; Sumatra (Siboga, Padang, Benkulen).— Philippines.

In sea.

17. Cynoglossus lida (Blkr.).

Plagusia lida Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 413. — Verh. Bat. Gen. XXIV. 1852. Pleuronect. p. 23.
Arelia lida Bleeker, Act. Soc. Sc. Indo-Neerl. VI. 1859, Enum. spec. piscium Arch. ind. p. 184.
Cynoglossus lida Günther, Cat. Brit. Mus. IV. 1862, p. 498 (s. syn.).
Cynoglossus lida Bleeker, Atl. ichth. VI. 1866—1872, p. 36.
Cynoglossus lida Day, Fishes of India 4°, 1878—1888, p. 436.
Cynoglossus lida Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 288.
Cynoglossus lida Vinciguerra, Ann. Museo Civ. Genova, 1890, p. 188.
? *Cynoglossus os* Fowler, Journ. Acad. Nat. Sci. Philadelphia (2) XII. Part 4, 1904, p. 556.
? *Cynoglossus lida* Jenkins, Mem. Ind. Museum III. 1910, p. 30.
Cynoglossus lida Tate Regan, Ann. Durban Mus. II. 1920, p. 221.

D. 100—110; A. 77—86; V. 4; L.l. about 90.

Very elongate. Height 4—4.6 in length with caudal, head 4.5—5 in length with caudal. Eyes about 10, less than one eyediameter apart. Vertical through hindborder of upper eye somewhat before that through middle of lower eye. Posterior nostril on coloured side pierced in interorbital space, anterior nostril tubular, near upper lip, those of blind side with an elevated rim at some distance of each other. Corner of mouth below hindborder of lower eye, more than one eyediameter nearer to branchial opening than to end of snout. Hook of upper jaw reaching to below eye. Scales ctenoid on both sides. Two lateral lines on coloured side, an upper and a middle one, separated by 13—14 scales. One indistinct median one on blind side. Colour of alcohol specimens light brownish, still lighter on blind side. Length 180 mm.

Nom. indig.: Lida (Mal. Bat.).

Habitat: Singapore; Nias; ? Sumatra (Padang); Java (Batavia); Celebes (Bulukomba, Menado); Salibabu 36 M.! — Coasts of India to Natal. In sea.

18. Cynoglossus lingua H. B.

Cynoglossus lingua Hamilton Buchanan, Fishes Ganges, 1822, p. 32, 365.
Pleuronectes potous Cuvier, Règne Animal vol. IV. 1836, p. 307, footnote (name only).

Plagusia lingua Cantor, Catalogue Malay Fish. Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1215.
Plagusia potous Bleeker, Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 23.
? *Arelia lingua* Kaup, Arch. f. Naturgesch. XXIV. 1, 1858, p. 107.
Arelia potous Bleeker, Act. Soc. Scient. Indo-Neerl. VI. 1859, Enum. spec. pisc. p. 185.
Cynoglossus lingua Günther, Cat. Brit. Mus. IV. 1862, p. 501.
Cynoglossus macrorhynchus Kner, Novara Exp. Fische, III. Abth. 1867, p. 295 (nec Bleeker).
Cynoglossus potous Bleeker, Atl. ichth. VI. 1866—1872, p. 33.
Cynoglossus lingua Day, Fishes of India 4°, 1878—1888, p. 433.
Cynoglossus lingua Vinciguerra, Ann. Mus. Civ. Genova 1890, p. 190.

D. 127—144; A. 100—106; V. 4; L.l. 81—96.

Very elongate, snout pointed. Height 4.7—5.3, 5.3—5.7 in length with caudal. Head 4—4.4, 4.4—4.8 in length with caudal. Eyes 11—15, one eyediameter or less apart, the upper one somewhat in advance of the lower one. Posterior nostril on coloured side pierced through interorbital space, the anterior one tubular, near upper lip. Nostrils on blind side at some distance behind each other, above curve of mouthopening. Corner of mouth below or somewhat behind hindborder of lower eye, nearer to branchial opening than to end of snout. Hook of upper jaw reaching farther backward than symphysis of lower jaw, but not so far as vertical through frontborder of upper eye. Scales ctenoid on coloured side, but in most of the scales the spines are soon worn off and they therefore make the impression of being cycloid. The scales on the blind side are cycloid from the beginning. Two lateral lines on coloured side, an upper and a middle one separated by 12 or 13 scales. On the blind side one indistinct lateral line. Colour of preserved specimens reddish or greyish, with indistinct dark cloudy patches. Opercular region blackish. Fins with a dark edge. Blind side colourless. Length over 400 mm.

Nom. indig.: Lida passir (Malay Bat.), Lattilat (Sundanese), Latjileh (Madura), Sebelah, Sebla or Lida-lida (Bagan Api Api).

Habitat: Singapore; Sumatra (Deli!, Bagan Api Api!, Benkulen, Trussan); Banka; Borneo (Pamangkat, Sinkawang, Pontianak); Java! (Batavia!, Cheribon, Tegal, Tjilatjap, Samarang, Rembang, Prigi, Surabaya!, Pasuruan); Madura. — Coasts of British India and Siam to indo-australian Archipelago. In sea and estuaries.

19. Cynoglossus borneensis (Blkr.).

Plagusia borneensis Bleeker, Act. Soc. Sci. Indo-Neerl. V. 1858—1859, 12de Bijdr. vischfauna Borneo p. 6.
Arelia borneensis Bleeker, Act. Soc. Scient. Indo-Neerl. VIII. 1860, 13de Bijdr. vischfauna Borneo, p. 9.
Cynoglossus borneensis Bleeker, Atl. ichth. VI. 1866—1872, p. 34.
? *Cynoglossus borneensis* Fowler, Proc. Acad. Nat. Science Philadelphia LVII. 1905, p. 518.
Cynoglossus borneensis Seale, Philip. Journ. Science V. N° 4, 1910, p. 288.

D. 112; A. 88; V. 4; L.l. circa 100.

Lanceolate. Height 4.6 in length with caudal. Head rounded in front, almost 5 in length with caudal. Eyes 9, the upper one before the lower one. Anterior nostril tubular, near upper lip, posterior one in interorbital space, which is 1.5 eyediameter. Nostrils of blind side with short tubes. Hook of upper jaw not reaching vertical through frontborder of upper eye. Corner of mouth below hindborder of lower eye, midway between branchial opening and end of snout. Scales strongly ctenoid on coloured side, cycloid on blind side. Two lateral lines on coloured side, an upper one and a median one, separated by 19 to 20 scales. One inconspicuous one on blind side. Coloured side with three approximate parallel longitudinal stripes, the middle one of which on median lateral line. A diffuse dark patch on opercular region. Blind side colourless. Length 213 mm. [After BLEEKER, not seen by us].

Habitat: Borneo (Sinkawang, Baram basin, Sandakan).

In sea.

20. Cynoglossus macrolepidotus (Blkr.).

Plagusia macrolepidota Bleeker, Nat. Tijdschr. Ned. Indië I, 1851, p. 415. — Verh. Bat. Gen. XXIV. 1852, Pleuronect. p. 25.
Arelia macrolepidota Bleeker, Acta Soc. Scient. Indo-Neerl. VI. 1859, Enum. spec. piscium p. 184.
Cynoglossus macrolepidotus Günther, Cat. Brit. Mus. IV. 1862, p. 496.
Cynoglossus macrolepidotus Kner, Novara Exp. Fische III. Abth. 1867, p. 294.
Cynoglossus macrolepidotus Bleeker, Atl. ichth. VI. 1866—1872, p. 34.
Cynoglossus macrolepidotus Day, Fishes of India 4°, 1878—1888, p. 434.
Cynoglossus macrolepidotus Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 288.
Cynoglossus macrolepidotus Rutter, Proc. Acad. Nat. Sci. Philadelphia 1897, p. 89.
? *Cynoglossus macrolepidotus* Seale, Philip. Journal Science V. N° 4, 1910, p. 288.

D. 107—113; A. 82—89; V. 4; L.l. 48—55.

Elongate, snout rather pointed. Height 3.8—3.9, 4.2—4.3

in length with caudal. Head 4.1—4.5, 4.3—5 in length with caudal. Eyes 11—15, one eyediameter apart, the upper one somewhat before the lower one, in one specimen they are above each other. Posterior nostril on coloured side in interorbital space, anterior one tubular, above upper lip; those of blind side with an elevated rim, at some distance behind each other, above curve of mouth. Corner of mouth behind lower eye, about midway between hindborder of operculum and point of snout. Hook of upper jaw not reaching to vertical through frontmargin of upper eye. Scales ctenoid on coloured side, cycloid on blind side. Two lateral lines on coloured side, an upper one and a middle one, separated by 6 or 7 scales. On the blind side one lateral line, not perforating the scales but shining through them. Colour of alcohol specimens brownish on coloured side, light on blind side. Each dorsal and anal ray marked with a dark stripe. Length 315 mm. [Specimen of BLEEKER's collection seen by us].

Nom. indig.: Lida (Malay, Batavia).

Habitat: Sumatra (Padang); Simalur!; Banka; Borneo (Sandakan); Java-sea!; Java (Batavia!, Anjer, Japara, Palabuan, Tuban!, Pasuruan!). — Philippines, Tonkin to China and Japan? [1]). Eastwards to British India and Ceylon.

In sea.

21. **Cynoglossus oligolepis** (Blkr.).

Plagusia oligolepis Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 445.
Arelia oligolepis Bleeker, Act. Soc. Scient. Indo-Neerl. VI. 1859, Enumeratio spec. piscium, p. 185.
Cynoglossus oligolepis Günther, Cat. Brit. Mus. IV. 1862, p. 496.
Cynoglossus oligolepis Bleeker, Atl. ichth. VI. 1866—1872, p. 34.
Cynoglossus oligolepis Steindachner, Fische aus China, 1867, p. 587.
Cynoglossus oligolepis Day, Fishes of India 4°, 1878—1888, p. 433.
Cynoglossus oligolepis Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 280.

D. 116—129; A. 81—94; V. 4; L.l. 58—65.

Elongate. Height 3.9—4.6, 4.3—5.1 in length with caudal. Head 4—4.4, 4.4—4.8 in length with caudal. Eyes 8—9, about one fourth of their diameter apart, the upper one somewhat in advance of the lower one. Posterior nostril of coloured side

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1) VON MARTENS (Exp. nach Ost-Asien 1876, p. 210, 339) is the only author who mentions this fish from Japan (Yokohama). It has never been found again so far north.

in interorbital space, the anterior one tubular and near upper lip. Nostrils of blind side at some distance behind each other, above curve of mouth, the anterior one more or less tubular, the posterior one with an elevated rim. Corner of mouth below or somewhat behind hindmargin of lower eye, somewhat nearer to branchial opening than to point of snout, the difference being one eyediameter or less. Scales rather strongly ctenoid on coloured side, cycloid on blind side. Two lateral lines on coloured side, an upper and a middle one, separated by 8 or 9 scales. On blind side one median lateral line, which does not perforate the scales. Colour of preserved specimens light brownish, somewhat lighter on blind side. Fins greyish. Length 365 mm.

Nom. indig.: Lida (Malay, Batavia).

Habitat: Sumatra (sea near Bagan Api Api!); Java (Batavia); Madura!; Java-sea!; South China sea!; Celebes (Makassar!). — British India and Ceylon, China (Ningpo). — In sea.

Note. This species is not easily distinguished from the preceding (*C. macrolepidotus*), with which it ought perhaps to be united.

22. **Cynoglossus brachycephalus** Blkr.

Cynoglossus brachycephalus Bleeker, Atl. ichth. VI. 1866—1872, p. 38.
Cynoglossus brachycephalus Tate Regan, Trans. Linn. Soc. London XII. (3) 1908, p. 235.
Cynoglossus brachycephalus M. Weber, Siboga-Exp. Fische 1913, p. 441.

D. 95—104; A. circa 80—90; V. 4; L.l. 55—60.

Elongate. Height 3.3, about 4 in length with caudal. Head 4.3, 4.7—5 in length with caudal. Eyes subcontiguous, 7—8, the upper one slightly in advance of the lower. One tubulate nostril on upper lip only on coloured side, on blind side two nostrils at some distance of each other, each with an elevated rim. Corner of mouth below middle of lower eye, nearer to tip of snout than to branchial opening. Lips of blind side swollen and provided with numerous vertical folds. Hook of upper jaw not reaching to vertical through frontborder of eye. Scales strongly ctenoid on both sides. Two lateral lines on coloured side, the upper one not so distinct as the middle one. They are separated by eight to ten scales. Colour of alcohol specimens brownish red, freckled with darker, rays of

vertical fins blackish. Blind side light reddish brown. Length 125 mm.

Habitat: West Sumatra; Java sea!; Java (Surabaya!); Strait Madura!; Bali!. — Indian Ocean.

In sea.

Note. GILCHRIST (Marine Invest. S. Africa, III, 1905, p. 12) describes a new species as *Cynoglossus brachycephalus*, this is quite another species which must therefore be renamed.

23. Cynoglossus grandisquamis (Cant.).

Plagusia grandisquamis Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1214.
Trulla grandisquamis Kaup, Arch. f. Naturgesch. XXIV. 1, 1858, p. 109.
Cynoglossus grandisquamis Günther, Cat. Brit. Mus. IV. 1862, p. 503.
Cynoglossus grandisquamis Duncker, Mitt. Naturh. Museum Hamburg XXI. 1904, p. 169.

D. 116; A. 88; V. 4; L.l. 59.

Height about 6 in length without caudal, head 5.3 in same length. Eyes close together, a bony protuberance above the lower. One nostril on coloured side in front of the lower eye, above the upper lip. Rostral hook short. Scales strongly ctenoid. Two lateral lines on coloured side, separated by 6 scales. Colour of the type specimen (a skin) reddish brown; a blackish band along and near the base of the dorsal and anal fins. Length 181 mm. [Not seen by us].

Habitat: Singapore. — Pinang. In sea.

Note. Mr. J. R. NORMAN kindly gave us some informations about the type of this species in the British Museum. CANTOR was mistaken in mentioning two ventrals in the description.

Doubtful species

1. Cynoglossus macrorhynchus (Blkr.).

Plagusia macrorhynchos Bleeker, Nat. Tijdschr. Ned. Ind. I. 1851, p. 413. — Verh. Bat. Gen. XXIV. 1852, p. 22.
Arelia macrorhynchos Bleeker, Enum. spec. pisc. Arch. ind. Act. Soc. Sc. Indo-Neerl. VI. 1859, p. 185.
Cynoglossus macrorhynchus Bleeker, Atl. ichthyol. VI. 1866—1872, p. 35.

BLEEKER described this species after a drawing left by KUHL & VAN HASSELT and which he reproduced in the Atlas

ichthyologique, Pleuronectidae tab. IV, fig. 2. It is incomplete as it does not give any indication about the scales.

KNER meant to have found back the species. But already BLEEKER expressed the opinion that KNER's determination was wrong and this species belonged to *Cynoglossus potous* Blkr. which is a synonym of *C. lingua* H.B. see page 203.

10. **Symphurus** Rafinesque.

(RAFINESQUE, Indice d'Ittiologia Siciliana, 1810, p. 52).
Aphoristia Kaup, Wiegman's Arch. 1858, p. 106.
Ammopleurops Günther, Cat. Brit. Mus. IV. 1862, p. 490.

Lanceolate. Eyes on left side. Scales ctenoid. No lateral line. Two nostrils on coloured side, one or none on blind side. Mouth small, twisted toward the blind side. Snout not produced in a hook overhanging the mouth opening. Dorsal, anal and

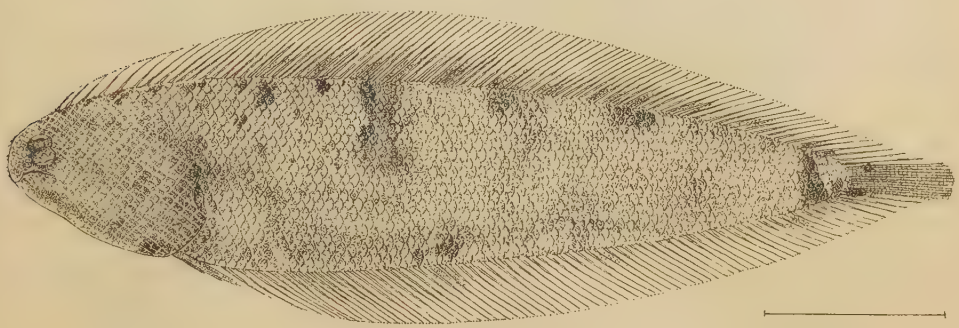

Fig. 55. *Symphurus microrhynchus* (M. Web.) × $2^1/_2$.

caudal confluent. Pectorals absent. Only the left ventral developed, not connected with anal. Gillmembranes united, more or less free from isthmus.

Distribution: Mediterranean, tropical parts of Indic, tropical and subtropical parts of Pacific, tropical part of West Atlantic.

Key to the indo-australian species of Symphurus.

1. A. 83—90.
   a. Head almost 6 in total length. . . . . *S. regani* p. 210.
   b. Head 4.5 in total length . . . . . *S. gilesi* p. 210.
2. A. about 68. Ll. about 68 . . . . . *S. microrhynchus* p. 211.

1. **Symphurus regani** nom. nov. [Fig. 56].

Aphoristia elongata M. Weber, Siboga-Exp. Fische, 1913, p. 444 (nec *Symphurus elongatus* (Gthr.)).

D. 100; A. 89—90; V. 4; L.l. 80—90.

Height 4.3, 4.7 in length with caudal. Head almost 6. Snout 1.5 eye-diameter. Eyes 7, separated by a very narrow interorbital space, above each other. Mouth reaching to below middle of eye. Posterior nostril on coloured side a wide low tube, situated anteriorly in the interorbital space, the anterior one has a longer tube and is situated before the lower eye. One tubular nostril on blind side. Ventral about one third of height of body, 2.5 eye-diameters from base of anal. Scales

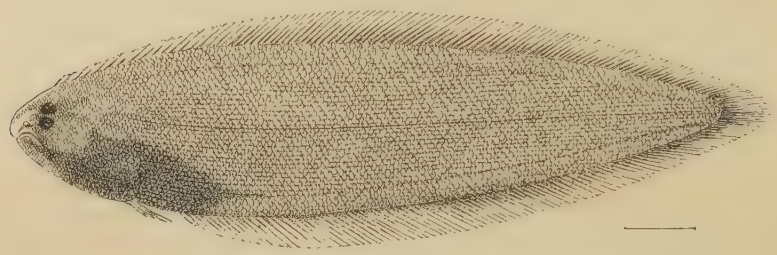

Fig. 56. *Symphurus regani* nom. nov. about n.s.

ctenoid on both sides. Colour of alcohol specimens brownish on coloured side, with longitudinal darker stripes corresponding to the rows of scales. The black pigment of inner wall of operculum and of abdominal cavity shines through the skin. Fins dark. Length 120 mm.

Habitat: Flores-sea, 694—794 M.!

2. **Symphurus gilesi** (Alc.).

Aphoristia gilesii Alcock, Journ. Asiat. Soc. Bengal LVIII. 1889, p. 293. — Descriptive Catalogue 1899, p. 131.

Aphoristia (Gilesi?) M. Weber, Siboga-Exp. Fische, 1913, p. 445.

D. 97—98; A. 83—85; V. 4; L.l.?

Height 4 in total length, head 4.5 in total length. Eyes 8, almost exactly on the same level, interorbital space scaly. A simple perforated nostril in the anterior part of the interorbit, and a tubular one about half as long as the eye midway between the lower eye and the tip of the snout. No nostrils on the blind side. Cleft of mouth horizontal, with a slight

down-curve at its angle, which is in the vertical from the middle of the eye. Scales of moderate size, ctenoid on both sides, and so deciduous that their number could not be correctly counted. The first eight rays of dorsal are separated by wide interspaces and (apparently) connected by membrane only at their bases. Ventral separated from origin of anal by little more than an eye-length. Colour of alcohol specimen yellow with numerous fine, parallel, brown lines extending along the body from head to caudal. Length 115 mm.

Habitat: A specimen of 49 mm. caught by the Siboga-Expedition near the Kei-Islands 397 M., possibly belongs to this species, which is otherwise only known from the Bay of Bengal, 347—378 M.

3. **Symphurus microrhynchus** (M. Web.). [Fig. 55, p. 209].

Aphoristia microrhynchus M. Weber, Siboga-Exp. Fische, 1913, p. 444.

D. about 88—90; A. about 68; V. 4; L.l. about 68.

Height equal to head, 4.5 in length, 4.8 in length with caudal. Eyes 7, contiguous, the upper one slightly in advance of the lower one. The mouth reaches to below hindborder of eye. Snout equal to eye. Ventral more than one third of head, two eye-diameters from anal. Scales ctenoid on both sides. Colour of alcohol specimen brownish with some dark spots along base of anal and dorsal, and with indications of five cross-bars. Length of single specimen known 50 mm.

Habitat: Java-sea, 82 M.!

LARVAL STAGES OF HETEROSOMATA.

Our material from the indo-australian Archipelago contains some planctonic larvae of Heterosomata, still in the symmetrical stage. We give the description and figures of two remar-

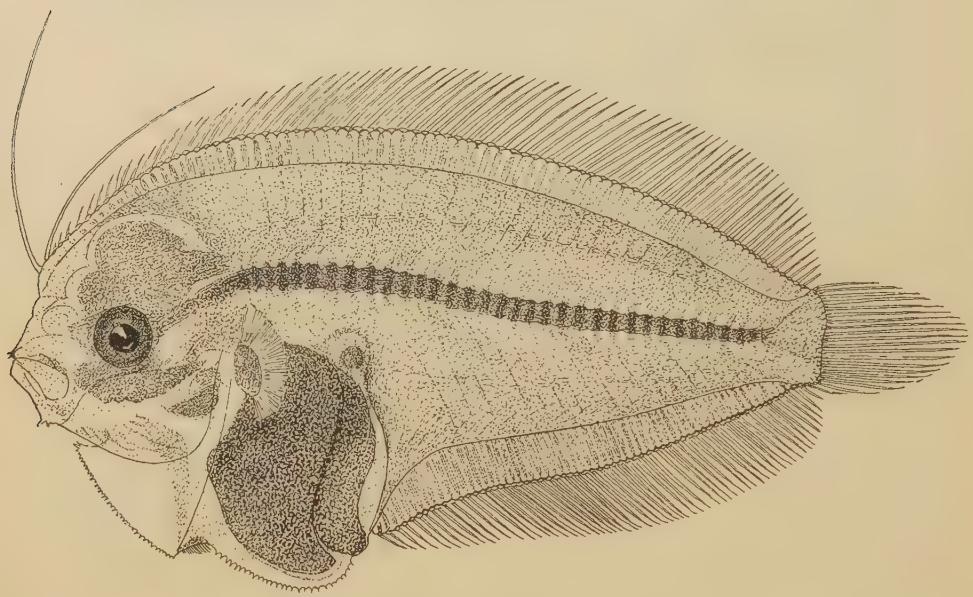

Fig. 57. Symmetrical larva, possibly of *Bothus* from Flores Sea. × 12.

kable specimens; they may perhaps be of some interest for future study of the metamorphosis of indo-australian Heterosomata.

1. *Larva from Flores sea.*

The larva of Fig. 57 of nearly 10 mm. length, caught in surface water near Sailus Ketjil, one of the Paternoster Islands, is remarkable by the ventral armature. The dorsal has about 80, the anal 62 rays. As part of them was broken, their length could only be reconstructed by using other specimens.

The two prolonged rays on the head are very conspicuous. The number of pectoral rays seems to be very high. We think it possible that it belongs to *Bothus*.

2. *Larva from Banda-Sea.*

The larva of Fig. 58 was caught in the surface water near the Island Kajoa.

The larva is distinguished by a dorsal fin with 88—89 rays.

Fig. 58. Symmetrical larva from Banda Sea. × 10.2.

of which the first is strongly prolonged, and by an anal with 63 rays. The ventrals are symmetrical and far distant from the anal. But this arrangement in the symmetrical larva may totally differ from the definitive arrangement when metamorphosis is finished. The pectorals are wanting.

The prolonged first dorsal ray reminds of the larva figured by A. GÜNTHER (Report of the Pelagic fishes collected by H. M. S. CHALLENGER, Challenger Reports XXXI) in Pl. I, Fig. B. But it differs by the continuous dorsal, caudal and anal, while they are separated in our larva.

Order BERYCOMORPHI.

Physoclistic [1]). Oblong or ovate, more or less compressed. Head usually with conspicuous mucous cavities; eyes lateral, usually large. Covered with ctenoid or cycloid scales or with bony plates. Lateral line present. A pair of hyoid barbels may be present. Mouth terminal or subinferior, usually oblique and wide, bordered by the protractile intermaxillary. Maxillaries rather large, connected with vomer and palatines and supplemented by one or two supramaxillaries which exceptionally may be wanting. Six to 9 branchiostegals; $3\frac{1}{2}$ or 4 gills, gillrakers moderate or long; gillmembranes separate, free from isthmus. Pseudobranchiae present. Opercular bones normally developed, often serrated or spinescent. Suborbital shelf present on the suborbital ring or absent. Parietals separated by the supraoccipital. Orbitosphenoids meeting each other mesially and united by suture with the alisphenoids or wanting. Jaws with villiform teeth in bands; teeth on vomer and palatines; they may be present also on pterygoids and parasphenoid and absent on vomer or the palate may be edentulous. Vent nearly always far behind ventrals, quite near anal. Vertebrae 22 to 46. Ventral fins thoracic or subabdominal with a spine and 3 to 13 soft rays. Anterior rays of vertical fins spinous; dorsal continuous or the spinous part deeply emarginate or separate.

1) *Beryx* and *Holocentrum* are said to retain the pneumatic duct through life, others (*Trachichthys*, *Polymixia*) to lose it with age, but REGAN (Ann. Mag. Nat. Hist. (8) VII. 1911, p. 2) says: "I cannot find a duct in any of the genera I have examined, including *Beryx* and *Holocentrus*, which are said to be physostomous".

Key to the indo-australian families of Berycomorphi, based on external characters of the indo-australian genera only [1]).

A. Teeth on palate.
  I. Dorsal fin with 2 to 8 spines.
    1. No subocular luminous organ.
      a. Scales normal. Ventrals with a spine and 6 soft rays.
        α. Dorsal fin with 4 to 6 spines. Anal with 3 spines. Caudal forked . . . . . *Trachichthyidae* p. 215.
        β. Dorsal fin with 6 to 8 spines. Anal with 2 spines. Caudal rounded . . . . . *Zeidae* p. 219.
      b. Scales bony, forming a coat of mail. Ventrals with one long spine and three soft rays . . *Monocentridae* p. 222.
    2. A subocular luminous organ. . . . . *Anomalopidae* p. 224.
  II. Dorsal fin with 10 to 13 strong spines. Anal with 4 spines. . . . . *Holocentridae* p. 228.
B. No teeth on palate.
    1. Ventrals with a spine and six to nine soft rays. Dorsal with two to six spines. . . . . *Melamphaidae* p. 262.
    2. Ventrals with a spine and 5 soft rays. Dorsal with seven to nine spines . . . . . *Caproidae* p. 265.

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1. Family TRACHICHTHYIDAE.

Body deep or somewhat elongate, compressed. Abdomen often with a median ridge or serrated scales. Head rather large, with large mucous cavities, covered by the skin. Eye large. Mouth large, oblique. Small teeth in bands in jaws and on palatines, present or absent on vomer. Dorsal and anal spines few. Ventrals thoracic, with one spine and six soft rays. Caudal forked. Scales moderate or small, ctenoid or partly cycloid. Alisphenoids separate, bridged by the orbitosphenoid. Coracoid narrowed forward below, not reaching the ventral profile, not embracing the pelvic bones, which are firmly attached to the cleithra above the symphysis. 26 vertebrae.

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1) *Polymixia nobilis* Lowe (Family *Polymixiidae*) has been recorded by GOODE & BEAN (Oceanic Ichth. 1895, p. 522) from the Arafura-sea, saying that it was taken by the Investigator and referring to ALCOCK, Ann. Mag. Nat. Hist. 1891. ALCOCK however got his specimens in the Andaman sea. So far as we know no member of the family *Polymixiidae* has been taken in indo-australian waters.

Key to the indo-australian species of Trachichthyidae.

1. A row of spiny scutes along abdominal edge, from between pectorals to anus . . . . . *Hoplostethus* p. 216.
2. No abdominal scutes . . . . . *Leiogaster* p. 218.

1. Hoplostethus C. V.

(Cuvier & Valenciennes, Hist. Nat. Poissons IV. 1829, p. 468).

Body deep, compressed, the ventral profile very much arched. Head deep, much compressed, with very conspicuous mucous cavities, covered by thin skin. Eyes large. Mouth large, very oblique. Jaws equal in front, with bands of small teeth, which are also present on the palatines, but absent from the vomer. Operculum entire, with radiating rugose ridges.

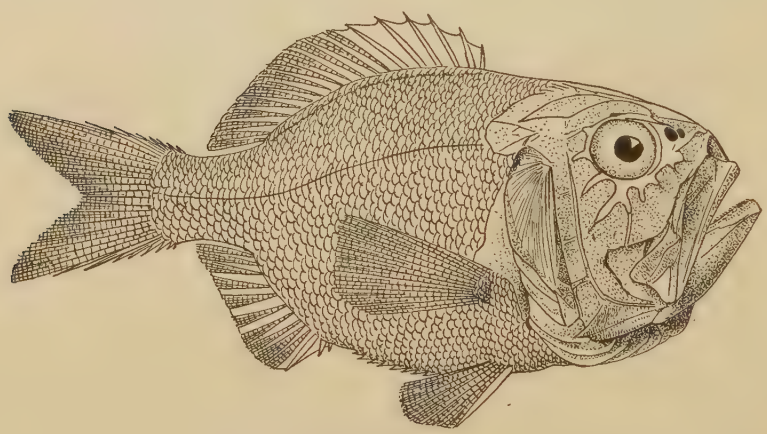

Fig. 59. *Hoplostethus mediterraneus* C. V. × 1/2.

A strong flat spine above operculum and at the edge of praeoperculum. Dorsal with five or six spines and twelve to eightteen soft rays. Anal with three spines, increasing in length posteriorly and eight to eleven soft rays, situated below hinderpart of dorsal. Caudal forked. Pectorals rather low down. Ventrals with a spine and six soft rays, their origin somewhat in advance of that of pectorals. Scales ctenoid, more or less sculptured, especially those of the lateral line, which are enlarged. Head naked. A row of spiny scutes along abdominal

edge from between pectorals to anus. Eight branchiostegals. Gillrakers long and slender.

Distribution: Atlantic, Mediterranean, Indic, Pacific to Japan and New-Zealand.

1. **Hoplostethus mediterraneus** C. V. [Fig. 59, p. 216].

Hoplostethus mediterraneus Cuvier & Valenciennes, Hist. Nat. Poissons IV, 1829, p. 469.
Hoplostethus mediterraneus Günther, Cat. Brit. Mus. I. 1859, p. 9.
Hoplostethus japonicus Hilgendorf, Sitzber. Ges. naturf. Freunde 1879, p. 78.
Hoplostethus mediterraneus Steindachner & Döderlein, Denkschr. Akad. Wien XLVII. 1883, p. 218.
Hoplostethus mediterraneum Günther, Challenger Exp. Zool. vol. XXII, 1887, p. 21.
Hoplostethus mediterraneus Goode & Bean, Oceanic Ichthyol. 1895, p. 189.
Hoplostethus mediterraneum Alcock, Descript. Catalogue 1899, p. 34.
Hoplostethus mediterraneus Jordan & Fowler, Proc. U. S. Nat. Mus. XXVI. 1902, p. 7.
Hoplostethus mediterraneum Brauer, Valdivia Exp. Tiefseefische 1906, p. 285.
Hoplostethus mediterraneum M. Weber, Siboga Exp. Fische 1913, p. 179.
Hoplostethus mediterraneus var. *latus* McCulloch, "Endeavour" Scient. Res. vol. II. Prt 3, 1914, p. 97.
Hoplostethus mediterraneus Waite, Rec. South Austral. Mus. vol. II. N° 1, 1921, p. 70.
Hoplostethus mediterraneum Barnard, Ann. S. Afric. Mus. XXI. 1925, p. 362.

D. VI. 14; A. III. 9; P. 1.14; V. I. 6; L.l. 29.

Height 1.8, 2 in lenght with caudal. Head 2.6, 3.2 in length with caudal. Eye scarcely longer than snout, 3.3 in head and equal to interorbital space. Sixth dorsal spine less than twice length of third anal spine, about equal to postorbital part of head. Pectorals as long as head without snout, ventrals about equal to eye and snout, 15 abdominal scutes. Colour in alcohol yellowish brown, darker above, more or less silvery below. Fins yellowish, membrane between dorsal spines darkish superiorly. Length 205 mm.

Habitat: Molucca passage 397 M.! — Coast of Madeira, Mediterranean, East coast of Africa, Bay of Bengal, coast of India, Japan, Great australian Bight.

Note. The description is made after the very large only known specimen from our area. It agrees with McCulloch's description of the variety *latus*. The differences (smaller eye) are due to the large size of our specimen. McCulloch mentions 11—12 abdominal scutes. As is well known this number varies greatly in different individuals.

2. Leiogaster M. Weber.

(M. Weber, Siboga-Exp. Fische 1913, p. 179).

Body deep, compressed, the ventral profile very much arched. Head deep, much compressed, with very conspicuous mucous cavities, covered by thin skin. Eyes large. Mouth large, very oblique. Jaws equal in front, with bands of small teeth, which are also present on the palatines. A small patch of deciduous teeth on vomer. Operculum entire, with radiating rugose ridges. A strong spine on suprascapular and on edge of praeoperculum. Dorsal with four spines increasing in length posteriorly and fifteen soft rays. Anal with three spines and ten rays, situated below hinderpart of dorsal. Caudal forked. Pectorals rather low down. Ventrals with a spine and six soft rays, their origin somewhat in advance of that of pectorals. Scales ctenoid above lateral line and on belly between pectorals and anus, otherwise cycloid, those of lateral line enlarged. Head naked. No abdominal scutes. Eight branchiostegals. Gillrakers long and slender.

Distribution: that of the single species known.

1. Leiogaster melanopus M. Web. [Fig. 60].

Leiogaster melanopus M. Weber, Siboga-Exp. Fische 1913, p. 180.

D. IV. 15; A. III. 10; P. 18—19; V. I. 6; L.l. 28.

Height 2.14—2.46 in total length. Head 3.5 in total length.

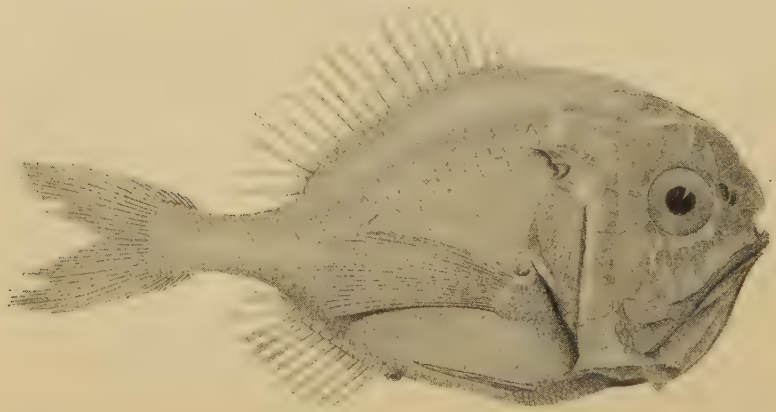

Fig. 60. *Leiogaster melanopus* M. Weber about $^{6}/_{8}$ n. s.
(In the anal the artist has omitted the first anal spine and erroneously represented the third spine as being articulated).

Eye as long as snout, about 3.6 in head. Fourth dorsal spine nearly as long as eye, third anal spine not much shorter. Pectorals reaching far on anal, ventrals not quite reaching anus. Colour of alcohol specimens brown, head and caudal lighter; dorsal and anal darkbrown, pectorals and ventrals black. Length 170 mm.

Habitat: Halmahera Sea 798 M.!, Ceram Sea 567 M.!, Flores Sea 538 and 649 M.!

2. Family Zeidae.

Body deep, much compressed and elevated. Series of bony plates on the belly, which is often serrated; they may also be present on the base of dorsal and anal. Mouth large, terminal, the upper jaw protractile. No supramaxillary. Small teeth in bands or a single series in jaws and on vomer and sometimes on palatines. Dorsal with six to ten spines, anal with one to four spines. Ventrals thoracic, with one spine and 6 to 8 soft rays. Caudal rounded. Pectorals short. Scales very small or wanting. Alisphenoids bordering upper part of brain cavity and nearly meeting above. Branchiostegals 7—8. 31—46 vertebrae.

Key to the indo-australian genera of Zeidae.

1. Dorsal with 8 spines, cheeks scaly. Teeth on vomer and palatines . . . . . *Cyttomimus* p. 219.
2. Dorsal with 6 spines, cheeks naked. Teeth on vomer, none on palatines . . . . . *Cyttula* p. 220.

1. Cyttomimus Gilbert.

(Gilbert, Bull. U.S. Fish Comm. XXIII. Part 2 (1903) 1905, p. 623).

Compressed, belly flattened. Eye large. Jaws very protractile, mouth oblique, with wide cleft. Teeth in narrow bands on jaws, vomer and palatines. Praeorbital with mucous cavities. Part of the opercular- and head-bones finely serrated. Dorsal continuous, the first part with eight spines. Anal with two spines. Caudal rounded. Scales moderate, ctenoid, covering the whole body. Cheeks scaly. No bony plates. Three and a half gills. Gillrakers short and few in number.

Two species known, one from the Hawaian islands and one from the indo-australian Archipelago, both in deep sea.

1. Cyttomimus affinis M. Weber. [Fig. 61].

Cyttomimus affinis M. Weber, Siboga-Exp. Fische 1913, p. 298.

D. VIII. 20; A. II. 20; P. 14; V. 1.6; L.l. 44; L. tr. $\frac{5}{1}$.
$\frac{}{12}$

Height nearly 2, 2.3 in length with caudal. Head 2.5, 3 in length with caudal. Eye somewhat more than snout, about 2.5 in head. Second dorsal spine longest, somewhat more than eye. Anal spines minute. Pectorals short, about equal to ventral spine and to snout. Caudal peduncle slender, its least height more than twice in its length. Three transversal rows

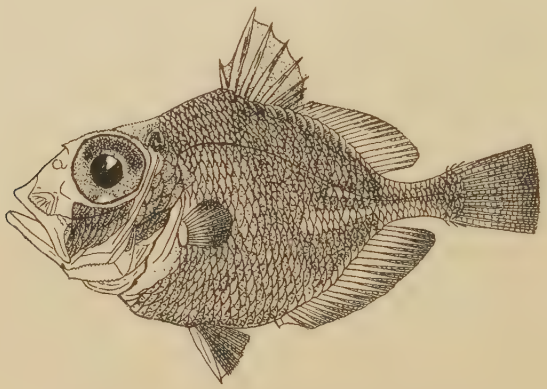

Fig. 61. *Cyttomimus affinis* M. Weber. n. s.

of scales on cheeks, four scales between lateral line and soft dorsal. Colour of alcohol specimen brown with metallic reflections, anterior part of head and caudal peduncle whitish. Last named however dark brown at base of caudal with a dark-brown streak on the lateral line, this streak widened posteriorly into a dark patch at base of caudal and continued anteriorly for some distance on body; above and below it faint longitudinal streaks, converging towards the caudal peduncle. Fins hyaline. Length of single specimen known 68 mm.

Habitat: Arafura Sea, 304 M.!

2. Cyttula M. Weber.

(M. Weber, Siboga-Exp. Fische 1913, p. 411).

Compressed, dorsal profile almost straight, ventral profile convex. Head with mucous cavities. Eyes large. Jaws very

protractile, lower jaw nearly vertical when the mouth is closed. Small teeth on jaws and on vomer. Part of the opercular- and head-bones finely serrated. Dorsal continuous, the first part with six spines. Anal with two spines. Caudal rounded. Pectorals very short. Ventrals very long, with one spine and six branched rays. Scales very small, ctenoid, covering the whole body; those of lateral line enlarged. No bony plates. Head naked. Three and a half gills, no slit behind the fourth gillarch. Gillrakers short and few in number. Branchiostegals 7. Only one species known.

1. **Cyttula macropus** M. Weber. [Fig. 62].

Cyttula macropus M. Weber, Siboga-Exp. Fische 1913, p. 411.

D. VI. 26; A. II. 25; P. 17; V. I. 6; Sq. lat. about 30.

Height about 2.5 in total length, head 2.2—2.5 in total length. Eye 2.2 in head. Snout two thirds of eye. Origin of dorsal above that of ventrals. Second dorsal spine longest, as

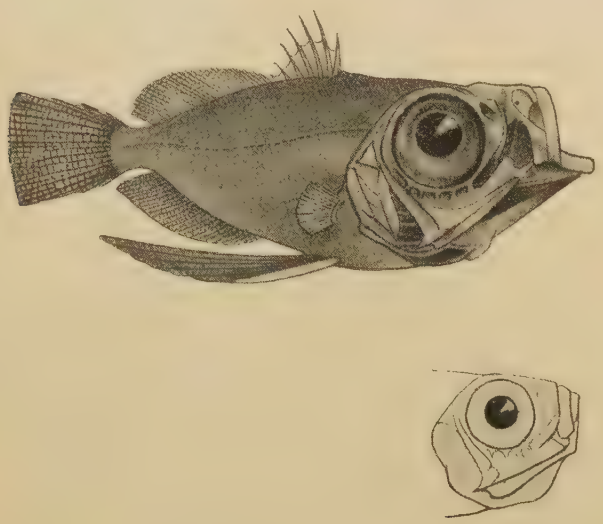

Fig. 62. *Cyttula macropus* M. Weber. n. s.

long as eye and less than twice first spine. Soft rays of dorsal and anal and pectoral rays undivided, subequal and less than half eye in length. Anal spines very small. Caudal rays branched. Ventrals with a strong spine, triangular in cross-

section, reaching to about fourth anal ray. The ventral rays increase gradually in length, the last one reaching on caudal. Brown, silvery below, head colourless, the bones being transparent. Dorsal and ventrals darkish. Length 68 mm.

Habitat: Flores sea, 538 M.!

3. Family Monocentridae.

Body deep, compressed. Abdomen keeled. Head large, with large mucous cavities covered by thin skin. Mouth large, oblique. Teeth in bands in jaws and on palatines, none on vomer. Dorsal with five or six spines, anal with two spines. Ventrals thoracic, with one long spine and three soft rays. Caudal forked. Scales large, bony, rigidly united and forming a coat of mail. The first four pairs of ribs are wanting.

Distribution: that of the single genus.

1. **Monocentris** Bloch Schneider.

(Bloch, Schneider, Systema Ichth. 1801, p. 100).

Body deep, compressed, the dorsal profile much arched.

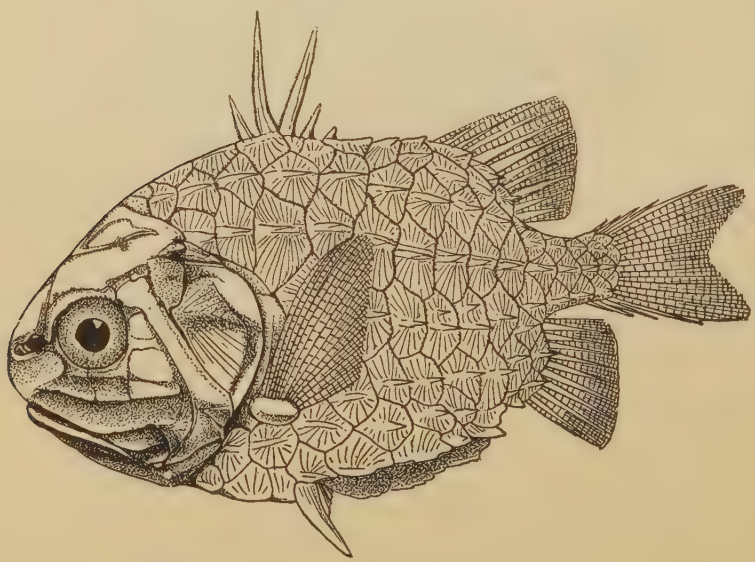

Fig. 63. *Monocentris japonicus* (Houtt.) $\times 5/7$.

Head large, with very conspicuous mucous cavities, covered by thin skin. Eyes large. Mouth large, almost inferior, the

rounded snout being very prominent. Bands of villiform teeth in the jaws and on palatines; none on vomer. Opercular bones entire. A luminous organ on each side of the symphysis of the lower jaw [1]). Dorsal with five or six spines, connected at their base only and followed by a soft dorsal of moderate extent. Anal moderate, partly opposite to soft dorsal. Caudal forked. Pectorals rather low down. Ventrals with one very long and strong spine, depressible into a groove along the body, and three minute soft rays. Scales very large, thick and bony, more or less keeled and forming a coat of mail on body. Abdomen keeled from between ventrals to anus. Eight branchiostegals. Gillrakers long, slender and rather numerous.

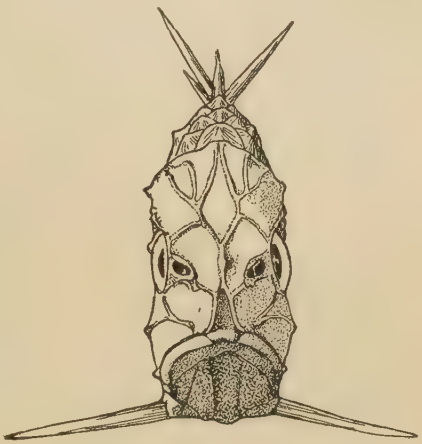

Fig. 64. Frontview of same. × 5/7.

Distribution: Two species, one in Indic and Pacific and another known from coast of Australia only. In sea to a depth of over 200 M.

1. **Monocentris japonicus** (Houttuyn).

[Fig. 63, p. 222, Fig. 64, p. 223].

Gasterosteus japonicus Houttuyn, Verh. Holland. Maatsch. Wetensch. Haarlem XX. 1782, p. 329.
Sciaena japonica (cataphracta) Thunberg, Nov. Act. Scient. Suec. XI. 1790, p. 102.
Monocentris carinata Bloch, Schneider, Syst. Ichth. 1801, p. 100.
Lepisacanthus japonicus Lacépède, Hist. Nat. Poissons III. 1802, p. 321.
Monocentris japonicus Cuvier & Valenciennes, Hist. Nat. Poissons IV. 1829, p. 461
Monocentris japonicus Schlegel, Fauna Japonica, 1847, p. 50.
Monocentris cataphracta Bleeker, Verh. Akad. Amsterdam I. Bijdr. icht. fauna Japan, 1854, p. 5.
Monocentris japonicus Brevoort, U. S. Japan Exp. Nat. Hist. Wash. 1856, p. 262.
Monocentris japonicus Günther, Cat. Brit. Mus. I. 1859, p. 9.
Monocentris japonicus Hilgendorf, Sitzber. Ges. naturf. Freunde. 1879, p. 22.
Monocentris japonicus Macleay, Descr. Cat. Austr. Fish. I. 1881, p. 145.
Monocentris japonicus Steindachner & Döderlein, Denkschr. Akad. Wiss. Wien XLVII. 1883, p. 217.

1) For a description see Yô. K. Okada. Biol. Bull. L. 1926, p. 365.

Monocentris japonicus Nyström, Bihang till K. Sv. Vet. Akad. Handl. XIII, Afd. IV, N⁰ 4, 1887, p. 4.
Monocentris japonicus Alcock, Ann. Mag. Nat. Hist. (7) II. 1898, p. 151. — Descr. Cat. 1899, p. 32.
Monocentris japonicus Jordan & Fowler, Proc. U. S. Nat. Mus. XXVI. 1902, p. 19.
Monocentris japonicus Franz, Abh. Kön. Bayer. Akad. Wiss. IV. Suppl. Bd. 1. Abth. 1910, p. 32.
Monocentris japonicus M. Weber, Siboga-Exp. Fische 1913, p. 188.
Monocentris japonicus Barnard, Ann. S. Afric. Mus. XXI. 1925, p. 360.

D. V—VI. 11—12; A. II. 8; P. 1.13; VI. 3; L.l. 13—16.

Height 1.6—1.8, nearly twice to 2.2 in length with caudal. Head 2.2—2.3, 2.5—2.8 in length with caudal. Eye 3.4, equal to snout and less than twice in the exceedingly convex interorbital space. Mouth very large, somewhat oblique, almost inferior. Lower jaw included in upper jaw. Maxillary reaching far behind hindborder of eye. Dorsal spines strongly heteracanth, diverging to left and right alternately when erected. Second spine the longest, somewhat longer than the third, which is twice as long as first spine; lastnamed spine is longer than fourth and fifth spine. Sixth spine, if present, minute. Origin of anal below middle of soft dorsal. Pectorals somewhat more than postorbital part of head. Ventral spine shorter or longer than head without snout. Colour of alcohol specimens yellowish or brownish. Length 160 mm.

Habitat: Batjan; Timor sea (216 M.)! — East coast of Africa (Mossel Bay); Andaman Sea; Philippines; China; Japan!; Australia (Port Jackson).

4. Family Anomalopidae.

Body deep or somewhat elongate, compressed, abdomen with a median ridge. Head rather large, without strongly developed mucous cavities. A large subocular luminous organ. Small teeth in bands on jaws and on palatines, absent on vomer. Dorsal and anal spines few. Ventrals thoracic, with one spine and five soft rays. Caudal forked. Orbitosphenoid present. Scales ctenoid, rugose.

Key to the genera of Anomalopidae.

1. Two dorsals, the first consisting of five spines . . . . *Anomalops* p. 225.
2. One dorsal, with a few weak spines anteriorly . . . . *Photoblepharon* p. 226.

1. Anomalops Kner.

(KNER, Sitzber. Akademie Wien LVIII. 1. 1868, p. 26, p. 294).
Heterophthalmus Bleeker (preoccupied).

Body rather elongate, compressed. Head deep, snout blunt and short. Eyes large, a row of papillae along superior part of postorbital border. Luminous organ evertile by a cartilagenéous rod, which can be worked by two antagonistic muscles.

Mouth rather large, oblique. Jaws equal in front, with bands of small teeth. Teeth on palatines, none on vomer. Opercular series smooth. Two dorsals, the first with five spines, the second one with one spine and fourteen soft rays. Anal with two short spines. Caudal forked. Pectorals low down. Ventrals thoracic with a weak spine and five soft rays. Scales small, rugose, ctenoid, irregularly arranged, those of belly forming a serrated ridge. Eight branchiostegals.

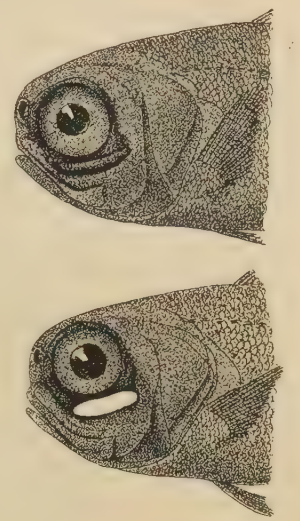

Fig. 65. *Anomalops katoptron* (Blkr.) n. s. In the upper figure the luminous organ is retracted and therefore invisible.

Distribution: Indo-Pacific from Celebes to Paumotu-islands and according to DAHLGREN in the Caribbean Sea.

1. Anomalops katoptron (Blkr.). [Fig. 65].

Heterophthalmus katoptron Bleeker, Acta Soc. Sc. Indo-neerl. I. 1856, Beschr. Vischsoorten Menado en Makassar, p. 43. — Nat. Tijdschr. Ned. Indië XVI. 1858—1859, p. 253. — Acta Soc. Sc. Indo-neerl. VIII. 1860, Elfde bijdr. vischfauna Ambon, p. 9.

Anomalops Graeffei Kner, Sitzb. Akad. Wien LVIII. 1868, p. 294.

Heterophthalmus katoptron Bleeker, Atl. ichth. IX. 1877. Tabula CCCLV. fig. 1.

Anomalops palpebratus Günther, Fische der Südsee, II. 1876, p. 143 (nec Boddaert).

Anomalops katoptron Bleeker, Arch. Neerl. Sc. nat. Haarlem XIII. 1878, p. 48.

Anomalops palpebratus Günther, Challenger Reports Zool. XXII. Deep-Sea Fishes, 1887, p. 41 (nec Boddaert).

Anomalops palpebratus Douglas Ogilby, Records Austr. Mus. I. 1890, p. 69 (nec Boddaert).

Anomalops palpebratus Goode & Bean, Oceanic Ichth. 1895, p. 191 (nec Boddaert).

Anomalops palpebratus Reuvens, Notes Leyden Mus. XIX. 1897, p. 127 (nec Boddaert).

Heterophthalmus katoptron Vorderman, Nat. Tijdschr. Ned. Indië LIX. 1899, p. 73.

Anomalops katoptron M. Weber, Siboga Exp. Introduction, 1902, p. 108. — Siboga Exped. Fische 1913, p. 189.
Anomalops katoptron Steche, Zeitschr. Wiss. Zool. Bd. 93, 1909, p. 355.

D^1 V. D^2 I. 14; A. II. 11—12; P. 1.17; V. 1.5; L.l. circa 75.

Height 3—3.3, 3.3—3.5 in length with caudal. Head 3.3—3.5, 3.5—4 in length with caudal. Eye 2.5—2.7, twice length of snout. Maxillary almost reaching to below hindborder of eye. First dorsal originating a little distance between axil of pectoral. Origin of second dorsal about midway between end of snout and base of caudal, the rays decreasing in length posteriorly, the first one being the longest. Origin of anal below middle of second dorsal, its spines small. Caudal deeply forked. Pectorals somewhat longer than ventrals, longer than postorbital part of head. Colour of alcohol specimens brownish. First dorsal darkish, second one hyaline with a basal and a subterminal longitudinal brown band. Anal with similar, but less distinct bands. Base of caudal darkish brown. Length: is said to attain a length of 300 mm.

Nomen indig.: Ikan laweri ajer (Banda).

Habitat: Celebes (Menado); Ambon; Banda!; New Guinea (Doreh); — New Hebrides, Fidji-islands, Rarotonga, Paumotu-islands.

Living pelagically (see Steche).

2. Photoblepharon M. Weber.

(M. Weber, Siboga-Exp. Introduction, 1902, p. 108).

Body rather deep, compressed. Head deep, snout short and rounded. Eyes large, two rows of papillae along superior part of postorbital border. Luminous organ not evertile but with an eyelid at its base, which can be drawn upwards to cover it.

Mouth rather large, very oblique. Jaws equal in front, with bands of small teeth, forming an external patch on each side of symphysis in lower jaw. No teeth on vomer, a few small ones on palatines. Opercular series smooth. One dorsal, with five unbranched and fifteen or sixteen branched rays, the two first simple rays spiny. Anal with two short and weak spines. Pectorals rather low down. Ventrals thoracic, with a spine and five soft rays. Scales very small, rugose, ctenoid, those of belly forming an indistinct serrated ridge between ventrals and anus. Eight branchiostegals.

Distribution: that of the single species known.

Fig. 66. *Photoblepharon palpebratus* (Bodd.) × 1½.

1. **Photoblepharon palpebratus** (Bodd.). [Fig. 66, 67, p. 228].

Sparus palpebratus Boddaert, Neue Nord. Beiträge Bd. II. Petersburg & Leipzig, 1781, p. 55.

Kurtus palpebratus Bloch Schneider, Systema Ichth. 1801, p. 164.

Bodianus palpebratus Lacépède. Poissons, nouv. édit. par Desmarest, 1826—1833, IV, p. 115, 118.

Heterophthalmus palpebratus Bleeker, Nat. Tijdschr. Ned. Indië XVI. 1858—1859, p. 253.

Photoblepharon palpebratus M. Weber, Siboga-Exp. Introduction 1902, p. 108.
Photoblepharon palpebratus Steche, Zeitschr. Wiss. Zool. Bd. 93, 1909, p. 354.
Photoblepharon palpebratus M. Weber, Siboga-Exp. Fische 1913, p. 191.

D. II. 3.15—16; A. II. 14—15; P. 1.14; V. 1.5; Sq. lat. circa 110; L.l. circa 40.

Height 2.3—2.4, almost 3 in length with caudal. Head 3.1, 3.8 in length with caudal. Eye 2,3, longer than snout. Maxillary reaching to below middle of eye. Dorsal originating somewhat behind axil of pectoral, the middle rays longer than the anterior and posterior ones. Dorsal spines short and weak.

Fig. 67. *Photoblepharon palpebratus* (Bodd.) n. s.

Origin of anal below middle of dorsal, ending opposite end of dorsal. Caudal deeply forked. Ventrals and pectorals subequal not much shorter than head without snout. Colour of alcohol specimens brown. Luminous organ white, as well as a patch above operculum, hindborder of operculum and base and hindborder of pectoral. Fins brownish, pectorals darker. Length about 90 mm.

Nom. indig.: Ikan leweri batu (Banda).

Habitat: Banda!; Ambon (Mus. Basel)!

Living among corals. For habits see STECHE o. c.

— — —

5. Family HOLOCENTRIDAE.

Body oblong or ovate, moderately compressed. Head moderate. Eye large. Mouth moderate. Bands of small teeth in both jaws, vomer, palatines and sometimes on ectopterygoid. Bones of the head grooved or with strong ridges, ending in shorter

or longer spines and forming a posterior serration, especially in the opercular series. Dorsal with ten or eleven spines and anal with four spines. Ventrals thoracic, with a spine and 5 to 8 soft rays. Caudal forked. Scales moderate, very strongly ctenoid. Alisphenoids joined in the median line. Coracoid narrowed forward below, not reaching the ventral profile, not embracing the pelvic bones, which are loosely attached by ligament above the symphysis of the cleithra. Vertebrae 26 or 27. Tropical and subtropical shorefishes.

Key to the indo-australian genera of Holocentridae.

1. A long spine at the edge of the praeoperculum . . . . *Holocentrum* p. 229.
2. No long spine at the edge of the praeoperculum. . . . *Myripristis* p. 250.

1. Holocentrum [1]) Scopoli.

(*Holocenthrus* Scopoli, Introd. Hist. Nat. 1777, p. 449).

Oblong or more or less elongate, rather compressed, back more or less arched. Caudal peduncle slender. Head compressed. Eyes large. Mouth moderate. Jaws equal, or the upper one slightly longer or the lower one protruding. Bands of small teeth on praemaxillaries, head of vomer, palatines, exoptergoids and lower jaw. Orbitals serrated. The praeorbital with a row of generally larger spines along its lower border and often similar spines along a median ridge. Nasalia broad and flat, bordering above the groove for the sliding peduncle of the praemaxillary, produced before the mouth in the larval fishes (*Rhynchichthys* and *Rhinoberyx*), which therefore have a pointed snout and an inferior mouth. Posterior and inferior border of praeoperculum, operculum and subopercullum with a row of crowded, parallel spines, less developed on interoperculum. A long spine at the edge of the praeoperculum and two flat spines in the superior part of the hindborder of the operculum. Dorsal beginning at a short distance behind head, separated by a deep notch into a longer anterior spiny part and a shorter posterior soft part. Dorsal spines strong, depressible in a groove, heteracanth. Normally eleven spines

1) The name *Holocentrum* is from Artedi. Gronovius changed it into *Holocentrus*. Scopoli was the first to use it in a binominal sense, but by misprint spelled it *Holocenthrus*.

are present, generally all belonging to the first part of the fin, or the last spine, which in this case is longer than the penultimate one, is situated behind the notch and close to the first soft dorsal ray. Anal opposite to soft dorsal, with four spines, the first of which is minute, the second one is larger, but still small, the third one enormously developed, much longer and thicker than the others and provided posteriorly with a groove,

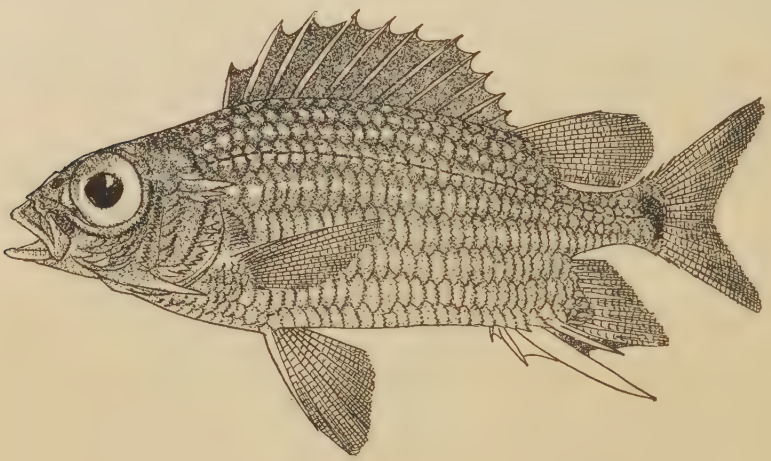

Fig. 68. *Holocentrum cornutum* Blkr. × 4/5.

to fit the last more slender spine. Eight to eleven soft anal rays. Caudal forked. Pectorals with a weak short spine. Ventrals with a slender spine and seven soft rays. Scales firm, large or moderate, strongly ctenoid, in several rows on praeoperculum and one row on anterior part of operculum. No scales on skull above, which is provided with divergent bony ridges. Lateral line continuous. Eight branchiostegals. Colour in life generally bright red, with silvery spots or longitudinal bands along the row of scales. Fins often with black and white markings.

Distribution: All tropical seas. Living near shore.

Key to the indo-australian species of Holocentrum.

A. Last dorsal spine, which is longer than penultimate one, close to first ray of soft dorsal. Lower jaw prominent.

1. A. IV. 9—10. Membrane of spinous dorsal jet black, with a white band . . . . . *H. operculare* p. 232.

2. A. IV. 7—8. Membrane of spinous dorsal never black, a black blotch between first spines may be present . . . . . *H. sammara* p. 233.

B. Last dorsal spine shortest, separated from soft dorsal by a deep notch. Jaws equal or upper jaw slightly prominent.

I. Four rows of scales between spinous dorsal and lateral line. L.l. 43 . . . . . *H. spiniferum* p. 235.

II. Three rows of scales between spinous dorsal and lateral line.

1. L.l. 46—51. Nasalia rounded in front, without spines. No spines at nasal opening.

a. Height 3.1—3.3. L.l. 50—51. A silvery patch below posterior part of spinous dorsal . . . . . *H. bleekeri* p. 237.

b. Height 2.9—3. L.l. 46—47. Membrane of spinous dorsal blackish, crossed by a white band. . . . . *H. diadema* p. 238.

2. L.l. 33—44.

a. Nasalia rounded in front, without spines. No spines at nasal opening. L.l. 41—44.

α. Eight or nine rows of scales on praeoperculum . . . . . *H. lacteo-guttatum* p. 240.

β. Six or seven rows of scales on praeoperculum. . . . . *H. melanotopterus* p. 242.

b. Nasalia ending anteriorly in two divergent spines. L.l. 33—41.

α. Snout blunt, much shorter than eye. No silvery patch on superior part of caudal peduncle.

a'. Nasal opening with spines . . . *H. cornutum* p. 243.

b'. Nasal opening without spines . *H. rubrum* p. 244.

β. Snout more pointed, equal to eye or nearly so. A silvery patch on superior part of caudal peduncle often present.

a'. Nasal opening with spines.

a^2. L.l. 34—37. Membrane of spinous dorsal scarcely incised *H. violaceum* p. 246.

b^2. L.l. 41. Membrane of spinous dorsal incised . . . . . *H. caudimaculatum* p. 247.

b'. Nasal opening without spines. . *H. tiereoides* p. 249.

1. Holocentrum operculare C. V.

Holocentrum operculare Cuvier & Valenciennes, Histoire Nat. Poissons VII. 1831, p. 501.

Holocentrum operculare Quoy & Gaimard, Voy. Astrol. Poissons, III, 1834, p. 676.

Holocentrum operculare Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 233.

Holocentrum operculare Günther, Cat. Brit. Mus. I. 1859, p. 47; Fische der Südsee I. 1873—1875, p. 100.

Holocentrum operculare Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 211.

Holocentrus operculare Seale, Occas. Pap. B. P. B. Mus. Hawaii I. 1901, p. 68.

Holocentrus opercularis Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 227.

D. XI. 13—14; A. IV. 9—10; P. 14; V. I. 7; L.l. 38—39; L. tr. $\frac{3}{8}$ $\frac{1}{1}$.

Rather elongate, dorsal profile sloping down in nearly a straight line from dorsal to snout. Height 3, 3.6 in length with caudal. Head 2.6, 3.2 in length with caudal. Eye 3.4, equal to snout. Interorbital space 0.7 of eye. Maxillary reaching to below anterior half of eye. Nasalia rounded in front, without spines. Lower jaw prominent. No spines at nasal opening. Lower praeorbital border hollow, with moderate spines directed backwards. Postorbital narrow, serrated. All pieces of opercular apparatus serrated along their hindborder, less so those of sub- and interoperculum. Praeopercular spine broad and moderately long, not reaching to branchial opening. Operculum with two flat, pointed spines. Seven transverse rows of scales on praeoperculum. Origin of dorsal separated by 7 scales from occiput. Second and third dorsal spine of equal length, longer than first and shorter than fourth, which is the longest and equal to postorbital part of head; tenth spine the shortest, less than half eye, eleventh spine only slightly longer. Membrane between the spines incised. First anal spine minute, second one as long as tenth dorsal spine, third one strong and long, almost equal to snout and eye together with a deep furrow behind to fit the fourth spine, which is slender and equal to postorbital part of head. Ventrals and pectorals subequal, as long as head and snout. Ventral spine somewhat longer than eye. Least height of caudal peduncle 1.5 in its length. Caudal forked. Colour of preserved specimen silvery, each scale being brown with a broad silvery border. Fins yellowish red. Membrane

of spinous dorsal jet black, with a white subbasal longitudinal band and a white upper margin, broadest immediately behind each spine. Length 240 mm. Description made after a specimen of 240 mm. length.

Habitat: Sumatra (Siboga); Flores; Banda!; Sangir Islands. — Pacific to Paumotu Islands.

2. **Holocentrum sammara** (Forsk.).

Sciaena sammara Forskål, Descr. Animalium 1775, p. 48.
Labrus angulosus Lacépède, Hist. Nat. Poissons III. 1802, p. 430.
Holocentrus samara Rüppell, Atl. Reise N. Afrika 1826—1831, p. 85.
Holocentrum sammara Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829. p. 216.
Holocentrum sammara Bleeker, Journ. Ind. Arch. II. 1848, p. 636. — Verh. Bat. Gen. XXII. 1849, Percoïd. p. 53. — Nat. Tijdschr. Ned. Indië III. 1852, p. 555.
Holocentrum sammara Günther, Cat. Brit. Mus. I. 1859, p. 46.
Holocentrum tahiticum Kner, Sitzber. Akad. Wien Bd 49, 1864, p. 482. — Novara Exp. Fische, I. 1865—1867, p. 9.
Holocentrum sammara Klunzinger, Verh. zool. bot. Gesellsch. Wien XX. 1870, p. 720.
Holocentrum sammara Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 213 p.p.
Holocentrum sammara Günther, Südsee Fische I. 1873—1875, p. 100.
Holocentrum sammara Day, Fishes of India 4°, 1878—1888, p. 173, p. 788, p.p. [1]).
Holocentrum sammara Klunzinger, Fische des Rothen Meeres I. 1884, p. 79.
Holocentrum sammara Sauvage, Poissons Madagascar 1891, p. 31.
Holocentrus fuscostriatus Seale, Occas. Papers B. P. B. Mus. Hawaii I. 1901, p. 69.
Holocentrus microstomus Fowler, Proc. Acad. Nat. Science Philadelphia LIII. (prt. 2) 1901. p. 325 (nec Gthr.).
Holocenthrus thorntonensis Fowler, l. c. LVI. 1904, p. 231.
Flammeo sammara Jenkins, Bull. U. S. Fish Comm. XXII. (1902) 1904, p. 440.
Flammeo sammara Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 155.
Holocentrus sammara Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 227.
Holocentrum sammara Barnard, Ann. S. Afric. Mus. XXI. 1925, p. 365.

var. laeve.

Holocentrum laeve Günther, Cat. Brit. Mus. I. 1859, p. 47. — Fische der Südsee I. 1873—1875, p. 101.
Holocentrum goldiei Macleay, Proc. Linn. Soc. N.S. Wales VII. 1882, p. 352.
Flammeo achromopterus Fowler, Proc. Acad. Nat. Science Philadelphia LVI. 1904, p. 236.
Holocentrum laeve Steindachner, Sitzber. Akad. Wien mathem.-naturw. Cl. CXV. Abt. I, 1906, p. 1375.
Holocentrus laevis Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 226.

1) Including *H. laeve*.

D. XI. 11—12; A. IV. 7—8; P. 13—14; V. I. 7; L.l. 37—42;
$\frac{3}{8}$
L. tr. $\frac{1}{1}$.

Rather elongate, dorsal profile sloping down in a gently curved line from dorsal to snout, more abruptly before the eyes, and more so in young specimens than in older ones; but there is a good deal of variation, the snout being blunter in some specimens *laeve*) than in others. Height 3—3.6, 3.7—4.2 in length with caudal. Head 2.6—2.9, 3.1—3.4 in length with caudal. Eye 2.8—3, slightly less than snout, in young specimens and sometimes in older ones the snout is shorter. Interorbital space 0.6—0.8 of eye. Maxillary reaching to below anterior half of eye or not quite so far. Nasalia rounded or obtusely pointed in front but without spine. Lower jaw prominent. No spines at nasal opening. Praeorbital with a row of subequal crowded spines and a larger blunt one in front, which disappears with age. Postorbital narrow, serrated along its hindborder. All the parts of the opercular apparatus are bordered with spines, less so in large specimens. Praeoperculum spine short and rather broad, not reaching to branchial opening. Seven transverse rows of scales on praeoperculum. Two rather long flat spines on upper part of operculum. Origin of dorsal separated by 6 to 7 scales from dorsal. Second and third dorsal spines longest, almost equal to fourth one and shorter than snout and eye together. Posteriorly the spines decrease in size, the penultimate one being the shortest; the last dorsal spine is slightly longer than the preceding one and about equal to half diameter of eye; membrane between the spines incised. First anal spine minute, second one longer, third one the longest and not quite equal to head without snout, with a deep furrow behind to fit the fourth, which is shorter than eye and snout. Ventrals and pectorals subequal, as long as eye and snout. Ventral spine somewhat longer than postorbital part of head. Least height of caudal peduncle 1.6—1.8 in its length. Caudal forked, the lobes rounded. Length 220 mm.

At the hand of our material and from descriptions of former authors we can recognize two forms, which often have been ranged as different species, while others (BLEEKER f. i.) have united them as one species. The differences are firstly one of colour. In the true *sammara* there is always a large black

blotch on the anterior part of the dorsal, extending over the membrane between the first to third or fourth spine. In some specimens there is moreover a row of white opaque patches along the free border and along the base of the dorsal. From this variety the other one, *H. laeve* can be distinguished by lacking the dark blotch on the dorsal, wheras the opaque patches are wanting, at least in our preserved specimens; the area where these patches are situated in the true *sammara* is bordered in *laeve* by a dusky streak. Besides this difference of coloration *sammara* can be recognized by its longer snout, the profile from eye to snout being less abrupt, even, although scarcely perceptible, in young specimens. In *sammara* the snout is equal to distance between frontborder of eye and hindborder of pupil, in *laeve* it is somewhat less than that distance. These differences are not sexual, as we examined males of both forms. They occur together. The coloration of the other parts of the fish is variable, the brightest markings are only to be found in specimens of the true *sammara*. In preserved specimens of *laeve* the colour is silvery or golden, with more or less distinct spots on the scales of cheeks and body, forming longitudinal rows. Sometimes the lobes of the caudal have each a sub-marginal longitudinal darkish streak. In *sammara* these streaks may be present or absent, often clearly marked and besides a similar streak may be present behind last anal spine and first soft ray of dorsal. In stead of the black spots on the scales of the body often dark brown longitudinal bands are visible, running along the rows of scales, that along the lateral line being sometimes darker than the others.

Habitat: Nias!; Sumatra (Padang, Benkulen); Java (South Malang); Sumbawa; Flores!; Lamakera!; Rotti!; Timor; Celebes (Menado); Biaru!; Talaut Islands!; Sangir-islands; Ternate; Batjan; Obi; Buru; Ambon; Ceram; Goram; Banda!; Misool; Waigeu!; New Guinea. — From Madagascar and coast of Zanzibar, Red Sea, British India to Japan, Philippines, eastwards to Tahiti and the Paumotu Islands.

The var. *laeve* has the same range westwards, but is not known either from Japan or east of Samoa.

3. **Holocentrum spiniferum** (Forsk.).

Sciaena spinifera Forskål, Descr. Anim. 1775, p. 49.
Holocentrum leo Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 204.

Holocentrum leo Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 355.
Holocentrum spiniferum Günther, Cat. Brit. Mus. I. 1859, p. 39.
Holocentrum spiniferum Kner, Novara Exp. Fische 1865—1867, p. 7.
Holocentrum andamense Day, Proc. Zool. Soc. 1870, p. 686.
Holocentrum spiniferum Klunzinger, Verhandl. zool. bot. Gesellsch. Wien XX. 1870, p. 725. — Fische des Rothen Meeres 4°, I. 1884, p. 79.
Holocentrum spiniferum Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 205.
Holocentrum spiniferum Günther, Fische der Südsee I. 1873—1875, p. 94.
Holocentrum andamense Day, Fishes of India 4°, 1878—1888, p. 172.
Holocentrum leo Sauvage, Poissons Madagascar 1891, p. 28.
Holocentrum spiniferum Sauvage, l. c. p. 30.
Holocentrus spinifer Fowler, Proc. Acad. Nat. Sci. Philadelphia 1899, p. 483.
Holocenthrus leo Fowler, l. c. XVI. 1904, p. 235.
Holocentrus spinifer Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 161.
Holocentrus spinifer Jordan & Seale, Bull. Bur. Fisheries XXV. (1905) 1906, p. 223.

D. XI. 1.14; A. IV. 10; P. 1.14; V. I. 7; L.l. 43; L. tr. $\frac{4}{1.}{}_{10}$

Oblong, dorsal profile running in a straight line from dorsal to snout, with a slight gibbosity at nape. Height 2.6, 3.1 in length with caudal. Head about 3, 3.5 in length with caudal. Eye 4 in head, slightly less than snout and 1.7 in postorbital part of head. Interorbital space narrow, almost twice in eye. Maxillary reaching to below anterior half of eye. Lower jaw somewhat prominent. Nasalia ending each in a bifurcate spine in front. No spines at nasal opening. Praeorbital with two larger obtuse spines and some much smaller slender ones between them. Postorbital narrow, with small denticulations, those of the hindborder of the praeoperculum are larger. Praeopercular spine large and stout, reaching to branchial opening. Six transverse rows of scales on praeoperculum. Operculum with three flat spines above, followed by numerous smaller spines, arranged in a parallel row. Origin of dorsal separated by about 9 scales from occiput. Second and third dorsal spine subequal, not quite as long as eye and snout. The first and third spine are more slender than the second and fourth. Posteriorly the spines decrease in size, the last one being the shortest and only one third of eye. Membrane between the spines very slightly notched. Second dorsal equal in height to the anal. First anal spine minute, third very stout, equal to eye and snout, with a deep furrow posteriorly to receive the fourth spine, which is much weaker than the preceding. Ventrals only slightly shorter than pectorals, which are some-

what shorter than head without snout. Ventral spine shorter than postorbital part of head. Least height of caudal peduncle 1.3 in its length. Caudal forked, the lobes pointed. Colour of alcohol specimen yellowish. Length over 400 mm. Description made after a specimen of 264 mm.

Habitat: Simalur!; Batu-Islands; Celebes (Menado); Batjan; Ambon!; Waigeu; New Guinea. — Red Sea, Madagascar, Chagos Archipelago, Mauritius, Andamans, Philippines and Pacific to Hawaiian islands.

4. Holocentrum bleekeri M. Weber.

Holocentrum argenteum Bleeker, Act. Soc. Sc. Ind. Neerl. III. 10e bijdrage vischfauna Amboina, 1858, p. 1. — Ned. Tijdschr. Dierk. IV. 1873, p. 208 (nec C. V.).
? *Holocentrum microstoma* Günther, Cat. Brit. Mus. I. 1859, p. 34. — Fische der Südsee I. 1873—1875, p. 98.
? *Holocentrum argenteum* Steindachner, Denkschr. Akad. Wien LXX. 1900, p. 492. (nec C. V.).
? *Holocentrus microstoma* Seale, Occas. Pap. B. P. M. Mus. Hawaii I. 1901, p. 70.
Holocentrum Bleekeri M. Weber, Siboga-Exp. Fische, 1913, p. 181.

D. XI. 1.11 (12); A. IV. 8—9; P. I. 1.13; V. I. 7; L. l. 50—51; L. tr. $\frac{3}{1}$.

Oblong, dorsal profile from snout to dorsal with a gentle curve. Height 3.1—3.3, 3.8—4 in length with caudal. Head 2.9—3.3, 3.5—4 in length with caudal. Eye large, 2.7—3.1; longer than snout. Interorbital space 0.6—0.7 of eye. Maxillary not quite reaching to below middle of eye. Nasalia rounded in front, without spines. Jaws equal. No spines at nasal opening. Lower border of praeorbital with a strong spine in front, followed by a series of smaller ones. Postorbital narrow, serrated. All pieces of opercular apparatus strongly serrated along their free border. Praeopercular spine broad and moderately long, not reaching gillopening. Two of the spines on the upper part of the operculum are enlarged, the upper one is as long as the praeoperculum one. Eight transverse rows of scales on praeoperculum. Origin of dorsal separated by 8 scales from occiput. Third to fifth dorsal rays the longest, slightly shorter than postorbital part of head. Last dorsal spine shortest. Membrane between the spines incised. First anal spine minute, third one very long and strong, not as long as head, but longer than head without snout. Ventrals longer than pectorals,

equal to head without snout. Ventral spine equal to or more than half length of head. Least height of caudal peduncle 1.3—1.5 in its length. Colour of preserved specimens reddish brown with silvery bands along the rows of scales, the one above the lateral line has a still brighter shining silvery patch below posterior half of spinous dorsal. Fins yellowish, dorsal sometimes with a submarginal dark band, interrupted by the spines, which are yellowish. Length 166 mm.

Habitat: Karkaralong islands!; Ambon; Banda!; New Guinea (Geelvink-bay). — Philippines, Pacific islands?

Note. KLUNZINGER (Fische des Rothen Meeres 4°, 1884, p. 80) has shown, that the species described by BLEEKER as *H. argenteum* is different from that of CUVIER & VALENCIENNES and QUOY et GAIMARD, which possibly is the same as *H. lacteoguttatum*. BLEEKER's species therefore had to have a new name, for which one of us proposed the name *bleekeri*. JORDAN & EVERMANN (Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 157) described a fish as *Flammeo scythrops*, which JORDAN & SEALE (Bull. Bureau Fish. XXV. (1905) 1906, p. 226) thought to be BLEEKER's *H. argenteum*. In fact however *Flammeo scythrops* is quite another species, belonging to the section with the last dorsal spine longer than the penultimate one. *Holocentrum microstoma* Günther is probably the same species. BLEEKER and other authors have been mislead by GÜNTHER's first statement, that there are 4 scales above the lateral line. In his "Fische der Südsee" however he corrected this mistake.

5. **Holocentrum diadema** Lac.

Holocentrus diadema Lacépède, Hist. Nat. Poissons V. 1803, p. 372, 374.
Holocentrus diadema Rüppell, Atlas Reise N. Afrika, Fische. 1826—1831, p. 84.
Perca pulchella Bennett, Zool. Journal III. 1827, p. 377.
Holocentrum diadema Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 213.
Holocentrum diadema Lesson, Voyage de la Coquille, Zool. II. 1829, p. 220.
Holocentrum diadema Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 259. — Ned. Tijdschr. Dierk. IV. 1873, p. 210.
Holocentrum diadema Günther, Cat. Brit. Mus. I. 1859, p. 42.
Holocentrum diadema Klunzinger, Verh. zool.-bot. Gesellsch. Wien XX. 1870, p. 723. — Fische des Rothen Meeres 4°, I. 1884, p. 79.
Holocentrum diadema Günther, Fische der Südsee I. 1873—1875, p. 97.
Holocentrum diadema Day, Fishes of India 4°, 1878—1888, p. 171.
Holocentrum diadema Sauvage, Poissons de Madagascar 1891, p. 33.

Holocentrus diadema Seale, Occas. Papers B. P. B. Mus. Hawaii I. 1901, p. 68.
Holocentrus diadema Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 159.
Holocentrum diadema M. Weber, Siboga-Exp. Fische, 1913, p. 180.
Holocentrum diadema Barnard, Ann. S. Afric. Mus. XXI. 1925, p. 366.

D. XI. 12—13; A. IV. 8—9; P. I. 1. 11—12; V. I. 7; L.l. 46—47; L. tr. $\frac{3}{8}$ 1.

Oblong, dorsal profile from snout to dorsal with a gentle curve. Height 2.9—3, 3.2—3.6 in length with caudal. Head 3—3.4, 3.6—4 in length with caudal. Eye 2.5—2.8, longer than snout. Interorbital space two thirds of eye. Maxillary not reaching to below middle of eye. Nasalia rounded in front, without spines. Jaws equal in front. No spines at nasal opening. A strong tooth, directed downwards, anteriorly on the praeorbital, followed by a series of smaller but well developed teeth, directed backwards, along the lower border of that bone; similar teeth are present on its median ridge. There is a good deal of variability in the number and the size of these teeth. Postorbital narrow, serrated. Praeopercular spine stout, equal to snout. Two enlarged spines in superior part of operculum, the upper one much longer than the lower one, longer than the praeopercular spine. Eight transverse series of scales on praeoperculum, 7 or 8 between occiput and origin of dorsal. Third to fifth or sixth or fourth to sixth dorsal spines the longest, about equal to snout and eye, last spine the shortest, equal to or longer than half diameter of eye. Membrane between the spines deeply incised. Third anal spine as long as or longer than head without snout. Ventrals longer than pectorals, equal to or longer than head without snout. Ventral spine about equal to snout and eye. Least height of caudal peduncle 1.6 in its length. Colour of preserved specimens reddish or greenish with light bands along the body, corresponding to the longitudinal rows of scales. Membrane of spinous dorsal blackish, crossed by a white band between the basal part of the anterior spines and a similar band between the upper part of the posterior ones. Uppermargin of dorsal sometimes also white. Membrane between third and fourth anal spine darkish. Length 160 mm.

Nom. indig.: Surendang (Simalur).

Habitat: Sumatra; Simalur!; Nias; Batu-islands; Java (Prigi); Borneo; Celebes (Badjoa, Menado); Biaru!; Sumbawa; Flores!; Timor; Buru; Ceram; Ambon; Banda!; Ternate; Halmahera; New Guinea. — From the Red Sea, East coast of Africa and Madagascar, seas of India, China, to Hawaiian islands.

6. **Holocentrum lacteo-guttatum** (C. V.) M. Weber.

? *Holocentrum lacteo-guttatum* Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 214.
? *Holocentrum punctatissimum* Cuvier & Valenciennes, ibid. p. 215.
? *Holocentrum argenteum* Cuvier & Valenciennes, ibid. VII. 1831, p. 502.
? *Holocentrum stercus muscarum* Cuvier & Valenciennes, ibid. p. 503.
? *Holocentrum argenteum* Quoy & Gaimard, Voyage Astrolabe III. 1834, Poissons p. 677.
Holocentrum punctatissimum Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 248. — Ned. Tijdschr. Dierk. IV. 1873, p. 215.
? *Holocentrum diploxiphus* Günther, Proc. Zool. Soc. London 1871, p. 660. — Fische der Südsee I. 1873—1875, p. 97.
? *Holocentrum argenteum* Klunzinger, Abhandl. zool.-bot. Ges. Wien XX, 1870, p. 721. — Fische des Rothen Meeres 4°, I. 1884, p. 80.
? *Holocentrus punctatissimus* Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 162.
? *Holocenthrus gladispinis* Fowler, Proc. Acad. Nat. Sci. Philadelphia LVI. 1904, p. 225.
? *Holocenthrus gracilispinis* Fowler, l. c. p. 228.
? *Holocentrus punctatissimus* Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 224.
Holocentrus lacteoguttatus Jordan & Seale, ibid. p. 225.
? *Holocentrus lacteoguttatus* Jordan & Richardson, Bull. Bureau Fisheries 1908, p. 247.
Holocentrum (*lacteoguttatum*?) M. Weber, Siboga-Exp. Fische, 1913, p. 183.

D. XI. 1.12 or 2.11; A. IV. 9—10; V. I. 7; L.l. 41—44; L. tr. $\frac{3}{8}$ 1.

Oblong. Height 2.9—3, 3.3—3.7 in length with caudal. Head 3—3.3, 3.3—4 in length with caudal. Eye 2.6—2.8, longer than snout. Interorbital space almost equal to three fourths of eye. Maxillary reaching to below middle of eye or not so far. Nasalia rounded in front, without spines. Jaws equal. No spines at nasal opening. Lower border of praeorbital with a rather strong spine in front, directed backwards and followed by a series of similar but smaller spines. Ridge on the praeorbital with some spines directed backwards and adpressed

to the bone, not always very distinct. Postorbital bone narrow, serrated. All pieces of opercular apparatus serrated along their hindborder. Praeopercular spine about equal to half diameter of eye. Two of the spines in the superior part of operculum enlarged, subequal and somewhat shorter than the praeopercular spine. Eight or nine transverse rows of scales on praeoperculum. Origin of dorsal separated by 6 scales from occiput. Second to fifth or third to fifth dorsal spines the longest, longer than postorbital part of head. Eleventh spine shortest, equal to half eye. Membrane between dorsal spines deeply incised. First anal spine minute, third one longest, not quite as long as head without snout. Pectorals with a short, thick spine, equal to half eye. Pectorals equal to head without snout, ventrals shorter, their spine somewhat longer than postorbital part of head. Least height of caudal peduncle 1.3—1.6 in its length. Colour of alcohol specimens silvery or golden, with more or less developed lighter longitudinal bands, corresponding with the rows of scales. The membrane between the dorsal spines is divided into a smaller milky white upper part and a much larger hyaline lower part, by a darkish band. Sometimes a darkish spot at base of first dorsal spines. Minute black spots scattered over head and body. Length about 120 mm.

Nom. indig.: Surendang (Simalur).

Habitat: Simalur!; Sumatra (Kauer); Java (Patjitan, Karangbollong); Bawean; Celebes (Menado!); Sangir-islands; Salibabu!; Ternate; Ambon; Ceram; Goram; Letti; Roma!; Timor!; Rotti!; New Guina (North coast). — Philippines.

Note. One of us (Siboga Exp. l. s. c.) has formerly given his opinion on the synonymy of this species. All the specimens from the Indo-australian Archipelago seen by us belong to what BLEEKER called *punctatissimum* and one of us *lacteo-guttatum*?. Reexamination of the types of CUVIER & VALENCIENNES can only decide, if *lacteo-guttatum*, *punctatissimum*, *argenteum* and *stercus-muscarum* of these authors are identical with the species, now in consideration. As has been shown by one of us, it is not sure that either the specimens from the Red Sea, described by KLUNZINGER as *argenteum*, or those from the Pacific described by GÜNTHER as *diploxiphus* and by the american authors as *lacteo-guttatum*, *punctatissimum*, *gladispinis*, *gracilispinis* belong to the same species or not.

If we exclude these doubtful specimens from the Red Sea, the east coast of Africa, Mauritius and those from the Pacific, the species, for which we use here CUVIER & VALENCIENNES' name *lacteo-guttatum*, has the above named distribution (the type of CUVIER & VALENCIENNES came: „de la mer des Indes").

7. **Holocentrum melanotopterus** Blkr.

Holocentrum melanotopterus Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 302. — Ned. Tijdschr. Dierk. IV. 1873, p. 217.
Holocentrum melanopterus M. Weber, Siboga-Exp. Fische 1913, p. 182.

D. XI. 15—17; A. III. 9—10; P. 1—13; V. I. 7; L.l. 41—43; L. tr. $\frac{2\frac{1}{2}}{6}$.

Oblong. Height 2.7, 3.4 in length with caudal. Head 2.5, 3.2 in length with caudal. Eye 2.6, longer than snout. Interorbital space about two thirds of eye. Maxillary reaching to below anterior half of head. Nasalia rounded in front, without spines. Jaws equal. No spines at nasal opening. Lower border of praeorbital with six or seven spines, directed backwards. Ridge of praeorbital spineless. Postorbital narrow, serrated. Opeculum and praeoperculum finely serrated along their borders; interoperculum with coarser serrations; suboperculum smooth (serrated according to BLEEKER). Two flat spines in superior part of operculum, the upper one the larger. Praeopercular spine more than half eye. Six or seven transverse rows of scales on praeoperculum. Six or seven scales between occiput and origin of dorsal. Second to fifth dorsal spine subequal and longer than the others, the last one the shortest. Membrane between the dorsal spines very deeply incised. Second anal spine longer and stronger than the third and about equal to snout and eye. First anal spine very small. Pectorals about equal to head without snout, ventrals somewhat shorter. Ventral spine equal to postorbital part of head. Least height of caudal peduncle 1.7 in its length. Colour of alcohol specimen light brown, fins hyaline. Anterior and posterior part of spinous dorsal blackish. Length 51 mm.

Habitat: Java (Patjitan); Celebes (Menado); Sangir islands; Flores; Buru; Ceram; Ambon; Savu!.

8. **Holocentrum cornutum** Blkr. [Fig. 68, pag. 230].

Holocentrum cornutum Bleeker, Nat. Tijdschr. Ned. Indië v. 1853, p. 240. — Ned. Tijdschr. Dierk. IV. 1873, p. 222.
Holocentrum melanospilos Bleeker, Act. Soc. Scient. Indo-Neerl. III. 1858, Negende bijdrage Vischfauna Ambon p. 2.
Holocentrum melanospilus Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 226.
Holocentrus cornutus Evermann & Seale, Bull. Bur. Fisheries XXVI. 1906, p. 60.
Holocentrum cornutum M. Weber, Siboga-Exp. Fische 1913, p. 182.

D. XI—XII. 13—14; A. IV. 9; P. I. 11—12; V. I. 7; L.l. 35—36; L. tr. $\frac{2\frac{1}{2}}{1}$ $\frac{}{6\frac{1}{2}}$.

Oblong, head blunt, its upper profile curved and rather abruptly descending from occiput to snout. Height 2.9—3, 3.4—3.7 in length with caudal. Head 2.9—3.3, 3.4—3.7 in length with caudal. Eye large, 2.2—2.5, longer than snout. Narrowest part of interorbital space more than half eye. Jaws equal in front. Maxillary reaching to below anterior half of eye. The nasalia end anteriorly in a blunt spine. Borders of nasal opening spiny. Lower border of praeorbital with a series of irregular blunt spines, praeorbital ridge with a large blunt spine in front, directed outward, followed by a few similar but much smaller spines and not always distinct. Hindborder of postorbital, which is narrow, densely denticulated. Opercular bones strongly denticulated. Two flat spines in upper part of operculum, the upper one much longer and stronger than the lower. Praeopercular spine somewhat shorter or longer than eye. Six to seven transverse rows of scales on praeoperculum; 5—7 scales between occiput and dorsal. Third and fourth dorsal spine the longest, last spine the shortest. Membrane between the dorsal spines rather deeply incised. Third anal spine somewhat shorter or longer than head without snout. Ventrals longer than pectorals, shorter or longer than head without snout. Ventral spine less than snout and eye. Least height of caudal peduncle 1.3—1.6 in its length. Colour of alcohol specimens lighter or darker brownish, with longitudinal silvery bands along the rows of scales. A dark blotch at base of caudal and on soft dorsal and anal present or absent. Membranes between dorsal spines partly blackish as also that between second and third anal spine and first soft ray of anal. Length 140 mm. [Specimen of BLEEKER's collection examined by us].

Habitat: Celebes (Badjoa); Flores; Buru; Ceram; Ambon; Banda!; Batjan. — Philippines.

Note. *Holocentrum melanospilus* Bleeker is stated by the author to differ from *H. cornutum* by lacking the outwards directed spine on the praeorbital and by the colouring of the dorsal fin. BLEEKER mentions also that the head of his single specimen is larger and that the eyes are smaller, but as his specimen is larger than those of *cornutum* with which he compared them, these differences are of no importance. We don't think that the lack of the praeorbital spine is sufficient to distinguish *melanospilus*, as we find in some specimens of *H. rubrum*, which is closely related to *cornutum*, a well developed spine, exactly like that of normal *cornutum*. There seems therefore to be a good deal of variation in the development of this spine in *rubrum* and we think it probable that this also may be the case in *H. cornutum*.

9. **Holocentrum rubrum** (Forsk.).

Sciaena rubra Forskål, Descript. Animal. 1775, p. 48.
Perca rubra Bloch, Schneider, Syst. Ichth. 1801, p. 90.
Holocentrum alborubrum Lacépède, Hist. Nat. Poissons IV. 1802, p. 372.
Perca praslin Lacépède, l. c. p. 418.
Holocentrus ruber Rüppell, Atl. Reise Nördl. Afrika, Zoologie, 1826—1831, p. 83.
Holocentrum orientale Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 197.
Holocentrum marginatum Cuvier & Valenciennes, l. c. III. p. 216.
Holocentrum laticeps Cuvier & Valenciennes, l. c. III. p. 157; VII. 1831, p. 376.
Holocentrum alborubrum Richardson, Ichth. China, Japan in 15th meet. Brit. Assoc. 1845, p. 223.
Holocentrum orientale Bleeker, Verh. Bat. Gen. XXII. 1849, Bijdrage kennis Percoïden, p. 53.
Holocentrum rubrum Günther, Cat. Brit. Mus. I. 1859, p. 35.
? *Holocentrum laticeps* Günther, t. c. p. 38.
Holocentrum rubrum Playfair, Fishes of Zanzibar 1866, p. 52.
Holocentrum rubrum Kner, Sitzber. Akad. Wien LVIII. 1. Abth. 1868, p. 296.
Holocentrum rubrum Klunzinger, Verh. zool.-bot. Ges. Wien XX. 1870, p. 722.
Holocentrum rubrum Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 224.
Holocentrum rubrum Günther, Fische der Südsee I. 1873—1875, p. 96.
Holocentrum rubrum Day, Fishes of India 4°, 1878—1888, p. 172.
Holocentrum rubrum Macleay, Descr. Cat. Austr. Fish I. 1881, p. 149.
Holocentrum rubrum Klunzinger, Fische des Rothen Meeres I. 1884, p. 80.
Holocentrum rubrum Sauvage, Poissons Madagascar 1891, p. 35.
Holocentrum rubrum Steindachner, Denkschr. Akad. Wien LXX. 1900, p. 492.
Holocentrus alboruber Jordan & Fowler, Proc. U. S. Nat. Mus. XXVI. 1902, p. 15.

Holocenthrus albo-ruber Fowler, Proc. Acad. Nat. Science Philad. LVI. 1904, p. 235.
Holocenthrus aureoruber Fowler, Journ. Acad. Nat. Sci. Philad. (2) XII. Prt. 4, 1904, p. 504.
Holocentrus praslin Jordan & Seale, Bull. Bur. Fisheries XXV. (1905) 1906, p. 225.
Holocentrus ruber Jordan & Seale, Proc. Dav. Acad. Sci. X. (1905) 1907, p. 5.
Holocentrus praslin Jordan & Starks, Proc. U. S. Nat. Mus. XXXII. 1907, p. 494.
Holocentrus ruber Jordan & Richardson, Bull. Bur. Fisheries. 1908, p. 248.
Holocentrus ruber Snyder, Proc. U. S. Nat. Mus. XLII. 1912, p. 496.
Holocentrus ruber Jordan & Starks, Ann. Carnegie Mus. XI. Nos. 3—4, 1917, p. 447.
Holocentrus ruber Fowler & Bean, Proc. U. S. Nat. Mus. LXII. 1922, p. 18.
Holocentrum rubrum Barnard, Ann. S. Afric. Mus. XXI. 1925, p. 366.

D. XI. 12—13; A. IV. 8—10; P. I. 12—13; V. I. 7; L.l. 33—36; L. tr. $\frac{2\frac{1}{2}}{6\frac{1}{2}—7}$.

Oblong, head blunt, its upper profile curved and rather abruptly descending from occiput to snout. Height 2.6—2.9, 3.1—3.5 in length with caudal. Head 2.8— 3, 3.4—3.8 in length with caudal. Eye large, 2.3—2.8, twice longer than snout. Narrowest part of interorbital space more than half eye. Jaws nearly equal in front, the upper one scarcely projecting. Maxillary reaching not quite as far as to below middle of eye. The bony ridges, which border the groove for the praemaxillary peduncle, end anteriorly in a blunt spine. No spines at nasal opening. Lower border of praeorbital with a series of irregular blunt spines; praeorbital ridge with smaller spines directed outwards, the first of which is somewhat larger. Hindborder of narrow postorbital densely denticulated. Opercular bones strongly denticulated. Two flat spines in upper part of operculum, the upper one longer and stronger than the lower one. Praeopercular spine less than eye or equal to it. Six or seven transverse rows of scales on praeoperculum, about six between occiput and dorsal. Third or third and fourth dorsal spine longer than the others, the last one the shortest. Membrane between the dorsal spines rather deeply incised. Third anal spine as long as head without snout or longer. Ventrals longer than pectorals, shorter or longer than head without snout. Ventral spine less than or equal to snout and eye. Least height of caudal peduncle 1.1—1.4 in its length. Colour of young specimens in alcohol dark reddish brown above, silvery below, each row of scales with a longitudinal broad silvery band. Operculum darkbrown, its hind-

border silvery. Upper part of membrane between dorsal spines blackish, as well as that between third and fourth anal spine and first soft ray. A longitudinal darkish streak on first ventral rays and on upper and lower lobe of caudal. In older specimens these different markings are less pronounced. Length 230 mm.

Nom. indig.: Mas-laut, Balong-merah, Sowangi-batu (Malay Batavia); Era-era, Kadera (Bintang), Kurisei batu (Banjermassin).

Habitat: Singapore; Sumatra (Telokbetong, Kauer, Benkulen, Trussan, Padang, Ulakan, Tiku, Priaman, Siboga); Batu-islands; Nias!; Bintang; Banka; Biliton; Duizend-islands; Java (Batavia!, Bantam, Karangbollong, Prigi, Patjitan, Japara); Bawean island; Borneo (Balikpapan!); Bali; Lombok!; Flores!; Savu!; Rotti!; Solor; Timor; Celebes (Makassar, Bulukomba, Badjoa, Menado, Kwandang--bay!; Tanawanko, Tombariri); Sulu islands!; Sangir-islands; Talaut-Islands!; Sula-islands!; Buru; Ceram; Ambon!; Banda!; Batjan; Ternate; Halmahera; Waigeu!; New Guinea (Doreh); Aru-islands. — From Madagascar, Mauritius and the Seychelles, east coast of Africa and the Red Sea, coasts of India, Ceylon to the Philippines and Japan, North and West Coast of Australia, Eastwards to Samoa.

The commonest species of *Holocentrum* in the indo-australian Archipelago.

Note. One of us (M. Weber, Siboga Exp. Fische 1913, p. 184) described the probable *Rhynchichthys*-stage of this species from the island Kur.

10. **Holocentrum violaceum** Blkr.

Holocentrum violaceum Bleeker, Nat. Tijdschr. Ned. Indië v. 1853, p. 335.
Holocentrum violaceum Günther, Cat. Brit. Mus. I. 1859, p. 43.
Holocentrum violaceum var. Kner, Sitzber. Akad. Wien LVIII. 1. Abth. 1868, p. 296.
Holocentrum violaceum Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 221.
Holocentrus violaceus Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 223.

D. XI. 14—15; A. III. 9; P. I. 13—14; V. I. 7; L.l. 34—37; L. tr. $\frac{2\frac{1}{2}}{1}$.
$\frac{}{8}$

Oblong, dorsal profile sloping in a gentle convex curve to

snout. Height 2.4—2.5, 3 in length with caudal. Head 2.8—3, 3.5—3.7 in length with caudal. Eye 3—3.3, about equal to snout. Interorbital space about 1.7 in eye. Jaws almost equal in front. Maxillary reaching to below anterior half of eye. The bony ridges, which border the groove for the peduncle of the praemaxillaries end each in two blunt spines. Two or more spines at border of nasal opening. Praeorbital with a large spine in front, directed downwards, followed by several smaller ones, which are directed backwards. Postorbital densely serrated along its hindborder, its width more than one third of eye. Opercular bones strongly serrated, two flat large spines in superior part of operculum. Praeopercular spine long and slender, about equal to postorbital part of head or somewhat shorter. Seven transverse rows of scales on praeoperculum, six or seven scales between occiput and origin of dorsal. Fourth or third and fourth dorsal spine longest, last spine shortest. Membrane between dorsal spines scarcely incised. First anal spine minute, second spine the longest, longer or much longer than postorbital part of head. Ventrals somewhat shorter than pectorals, which are equal to head without snout, their spine less than eye. Ventral spine longer than eye but shorter than eye and snout. Least height of caudal peduncle 1.1—1.3 in its length. Colour of alcohol specimens dark purplish-brown, each scale with a broad silvery subterminal longitudinal band. A more or less conspicuous black blotch at upper end of operculum. A silvery patch on upper side of caudal peduncle, immediately behind dorsal. Fins hyaline, spinous dorsal dusky. Length 225 mm.

Habitat: Flores; Timor; Ambon; Waigeu!; New Guinea. — North Australia, Fidji-islands, Samoa.

11. Holocentrum caudimaculatum Rüpp.

Holocentrus spinifer Rüppell, Atlas Reise Nördl. Afrika, Fische, 1826—1831, p. 86 (nec Forskål).
Holocentrum caudimaculatum Rüppell, l. c. p. 97.
Holocentrum spiniferum Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 206; VII. 1831, p. 498.
Holocentrum leonoides Bleeker, Verh. Bat. Gen. XXIII. 1850, Percoiden p. 54.
Holocentrum caudimaculatum Günther, Cat. Brit. Mus. I. 1859, p. 41.
Holocentrum caudimaculatum Steindachner, Ichth. Mitth. I. 1861, p. 71.
Holocentrum caudimaculatum Kner, Nova Exp. Fische, 1865—1867, p. 8.

Holocentrum caudimaculatum Playfair, Proc. Zool. Soc. London 1867, p. 855.
Holocentrum caudimaculatum Klunzinger, Verhandl. zool. bot. Gesellsch. Wien XX. 1870, p. 724. — Fische des Rothen Meeres I. 1884, p. 79.
Holocentrum caudimaculatum Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 219.
Holocentrum caudimaculatum Günther, Fische der Südsee I. 1873—1875, p. 95.
Holocentrum caudimaculatum Day, Fishes of British India 4°, 1878—1888, p. 172.
Holocentrus caudimaculatus Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 223.

D. XI. 14; A. IV. 9; P. I. 1.12; V. I. 7; L.l. 41; L. tr. $\frac{3}{1.8}$.

Oblong, dorsal profile feebly arched, profile of head slightly convex. Height 2.4—2.6, 3—3.2 in length with caudal. Head almost 3, 3.4—3.6 in length with caudal. Eye 2.7—3, longer than snout. Interorbital space 1.4—1.5 in diameter of eye. Maxillary reaching to below middle of eye. The bony ridges, which border the groove for the peduncle of the praemaxillaries end in a blunt bifid spine in front. Frontmargin of nasal opening with one or more spines, scarcely developed in young specimens. Jaws nearly equal, the chin being scarcely prominent. Lower border of praeorbital with a blunt spine in front, directed downward and followed by smaller teeth, which are directed backward. Postorbital strongly serrated. All pieces of opercular apparatus well serrated. Praeopercular spine long and pointed, far exceeding branchial opening and equal to or longer than eye. Two flat enlarged spines at superior part of hindborder of operculum, almost equal in length or the upper one the longer. Seven transverse rows of scales on praeoperculum. Eight scales between occiput and base of dorsal. Fourth or fourth and fifth dorsal spines the longest, longer than postorbital part of head. Last dorsal spine shortest, less than half eye. Membrane between the spines incised. Third anal spine longer than eye and snout. Ventrals slightly longer than pectorals, equal to head without snout. Ventral spine longer than postorbital part of head, but shorter than eye and snout. Least height of caudal peduncle 1.4—1.5 in its length. Colour of preserved specimens reddish or yellowish, a conspicuous silvery patch on upper part of caudal peduncle, immediately behind dorsal. A reddish brown band along base of dorsal and anal. Length almost 200 mm. [A specimen of BLEEKER's collection seen by us].

Nom. indig.: Surendang (Simalur).

Habitat: Simalur!; Batu-Islands; Java; Lombok!; Celebes (Makassar, Menado); Sangir-islands; Flores!; Timor; Buru; Ambon; Banda!; Batjan; Halmahera; Ternate; Misol; Waigeu; New Guinea (Doreh, South eastern part). -- From Madagascar and the Red Sea to the Philippines, Pelew Islands and eastwards to Samoa and Tahiti.

12. Holocentrum tiereoides Blkr.

Holocentrum tiereoides Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 334. — Ned. Tijdschr. Dierk. IV. 1873, p. 228.
Holocentrum binotatum Bleeker, Nat. Tijdschr. Ned. Indië XV. 1858, p. 207. — Ned. Tijdschr. Dierk. IV. 1873, p. 229.
Holocentrum binotatum Günther, Cat. Brit. Mus. I. 1859, p. 40.
Holocentrum binotatum Günther, Südsee-Fische I. 1873—75, p. 98.
Holocentrum binotatum Seale, Occas. Papers B. P. B. Mus. Hawaii I. 1901, p. 68.
Holocentrus tiereoides Bryan & Herre, Occas. Papers ibid. II. 1903, p. 128.
Holocentrus tiereoides Jordan & Seale, Bull. Bur. Fish. XXV. (1905) 1906, p. 224.
Holocentrus binotatus Jordan & Seale, l.c.
Holocentrum tiereoides M. Weber, Siboga Exp. Fische 1913, p. 124.

D. XI. 12—14; A. IV. 8—9; P. I. 13; V. I. 7; L.l. 38—41; L. tr. $\frac{2\frac{1}{2}}{1}$ $\frac{}{7—8}$.

Oblong, snout rather pointed, upper profile feebly arched. Height 2.5—2.8, 3.1—3.4 in length with caudal. Head 2.6—2.9, 3.2—3.6 in length with caudal. Eye 2.9—3.2, slightly longer than snout. Interorbital space 1.5 to nearly twice in eye. Maxillary reaching almost or quite to below middle of eye. The bony ridges, which border the groove for the peduncle of the praemaxillaries end in one or two spines in front. Borders of nasal opening without spines. Jaws equal in front. Lower border of praeorbital with a blunt spine in front, directed downwards and followed by smaller teeth, which are directed backwards. Postorbital narrow, strongly serrated. Praeopercular spine long and strong, exceeding branchial opening and about equal to eye. Two flat spines at superior part of hind-border of operculum, the upper one slightly longer than the lower one. Seven to eight transverse rows of scales on praeoperculum and about seven scales between occiput and first dorsal. Fourth dorsal spine the longest, longer than postorbital part of head. Last dorsal spine the shortest. Membrane between the dorsal spines incised. Third anal spine thick, equal

to eye and snout. Ventrals and pectorals subequal, equal to head without snout. Ventral spine longer than postorbital part of head, but shorter than eye and snout. Least height of caudal peduncle 1.2—1.5 in its length. Colour of preserved specimens yellowish brown, with silvery bands according to the longitudinal rows of scales. Sometimes the scales have a darker reddish spot in their middle, the silvery bands therefore having a row of spots along their median line, equal in number to that of scales in a longitudinal series. In some specimens the scales have a broader or narrower silvery free margin and in one specimen there is a silvery patch on the upper part of the caudal peduncle, just behind the dorsal. Fins yellowish. Length 165 mm. [Specimens of *Holocentrum binotatum* from BLEEKER's collection in the Leiden Museum seen by us].

Habitat: Pulu Weh!; Kambangan!; Celebes (Menado); Flores!; Pulu Besar; Banda!; Ambon!; Goram; Letti; Ternate; N. Guinea. — Marcus Island; Marianas; Marshall Islands; New Hebrides; Salomon Islands; Tahiti.

2. **Myripristis** Cuvier.

(CUVIER, Régne Animal Ed. II. vol. II. 1829, p. 150).

Oblong, rather compressed, back more or less arched. Caudal peduncle slender. Head somewhat compressed. Eyes large. Mouth moderate. Lower jaw slightly included, chin prominent. Bands of small teeth, which are pointed or more or less rounded, in both jaws; in a triangular or quadrate patch on head of vomer and in bands on palatines. The teeth of the outer series in the upper jaw are generally somewhat larger, especially a patch at some distance from symphysis. There are corresponding patches of tubercular teeth in the lower jaw, which are partly directed outwards, sometimes two similar patches of teeth on chin. Similar tubercular teeth often in a row on lower edge of hindborder of maxilla. Orbitals and opercular bones serrated. A flat spine on upper part of posterior border of operculum generally present. Praeoperculum without long spine. Nasalia produced in the larval fishes (*Rhynchichthys*). Dorsal beginning at a short distance behind head, separated by a deep notch into a longer anterior spiny part, which has ten to twelve spines and a shorter posterior

part consisting of one spine and twelve or more soft rays. Dorsal spines depressible in a groove, heteracanth. Anal opposite to soft dorsal, with four spines, the first of which is minute, the second one larger, the third always stronger and generally longer than the others and provided posteriorly with a groove to fit the fourth more slender spine. Eleven to fifteen soft anal rays. Caudal forked. Pectorals with a weak, flexible spine and fourteen to sixteen soft rays. Ventrals with a long slender

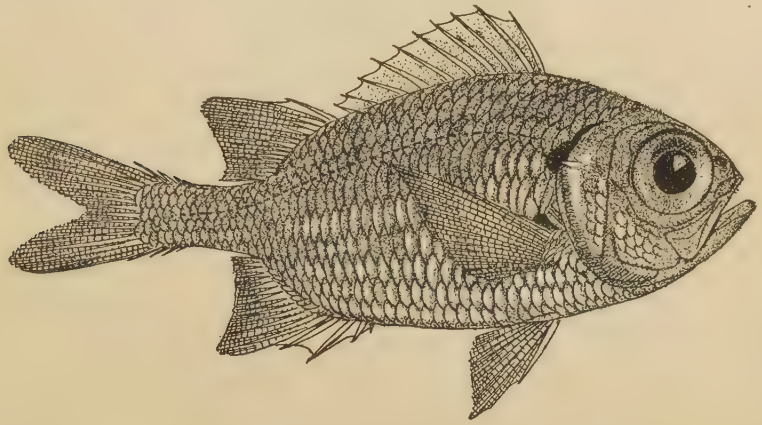

Fig. 69. *Myripristis pralinius* C. V. $\times$ $^2/_3$.

spine and seven soft rays. Scales firm, large, strongly ctenoid, in several rows on praeoperculum. No scales on skull above, which is provided with a few divergent bony ridges, in one species covered by arborescent ridges. Lateral line continuous. Eight (exceptionally seven) branchiostegals. Colour in life generally bright red with golden and silvery reflections or longitudinal bands.

Distribution. Tropical parts of Indic and Pacific and a few species on both sides of Atlantic.

Key to the indo-australian species of Myripristis.

I. First dorsal with twelve spines (Holotrachys) . *M. lima* p. 252.

II. First dorsal with eleven spines. D. XI. 1.13. A. IV. 11. *M. kaianus* p. 253.

III. First dorsal with ten spines. D. X. 1.14—17. A. IV. 12—15.

A. L.l. 36—40. Maxillary reaching to below hind-margin of pupil, its height posteriorly equal to half eye. . . . . *M. pralinius* p. 253.

B. L.l. 35—36. Maxillary reaching to below posterior half of eye, posteriorly higher than half eye . . . *M. hexagonus* p. 256.

C. L.l. 28—32.

a. Upper part of head completely rugose by arborescent ridges. L. l. 32. Third anal spine long, equal to eye and snout . . . . . *M. trachyacron* p. 257.

b. Upper part of head with a few ridges, bordering smooth parts, and splitting into fan-like arranged ridges posteriorly. L.l. 27—30. Third anal spine equal to eye or to postorbital part of head.

1. Two patches of strong tubercular teeth on chin, besides two other ones above them on lower jaw. L.l. 27—29. . . . . *M. melanostictus* p. 258.

2. No patches of teeth on chin or only indicated by a few teeth, the upper pair of teeth patches generally present. L.l. 28—30 . . . *M. murdjan* p. 259.

1. Myripristis (Holotrachys) lima C. V.

Myripristis lima Cuvier & Valenciennes, Hist. nat. Poissons VII. 1831, p. 493.
Myripristis humilis Kner & Steindachner, Sitzber. Akad. Wiss. Wien LIV. 1866, p. 357.
Myripristis (Holotrachys) lima Günther, Fische der Südsee I. 1873—1875, p. 93.
Holotrachys lima Sauvage, Poissons de Madagascar, 1891, p. 25.
Myripristis (Holotrachys) lima Steindachner, Denkschr. Akad. Wien LXX. 1900, p. 492.
Holotrachys lima Jenkins, Bull. U. S. Fish Comm. XXII. (1902) 1903, p. 439.
Holotrachys lima Jordan & Evermann, ibid. XXIII (1903) 1905, p. 147.

D. XII. 1.13; A. IV. 11; P. 1.16; V. I. 7; L.l. 40; L. tr. $\frac{4\frac{1}{2}}{\frac{1}{11}}$.

Oblong, not much compressed, head rather broad. Height 2.4, 2.9 in length with caudal, equal to head. Eye 3.7. Interorbital space a little more than half eye, 6.4 in head. Snout two thirds of eye. Maxillary reaching beyond posterior margin of eye, its lower border at posterior edge without denticles, its height posteriorly equal to eye. Lower jaw fitting in a notch in the upper jaw. No teeth on tongue. Most dermal bones of head covered by small spines, the ridges on the upper part of head also with rows of erect spines. Origin of dorsal separated by 12 scales from occiput. Second to fourth dorsal subequal, a little longer than eye and as long as third anal spine, which is longer and stronger than fourth one. Pectorals rounded, equal to postorbital part of head. Ventrals

shorter than pectorals, their spine longer than eye. Caudal emarginate. Least height of caudal peduncle equal to its length and equal to eye. Gillrakers long and slender, eleven on lower branch of first arch. Scales very spiny. Colour of alcohol specimen uniform pale reddish. Length nearly 190 mm. Description made from a specimen of 133 mm. length, the only one known from the indo-australian Archipelago.

Habitat: Banda!. — Madagascar, Mauritius, Samoa-, Kingsmill-, Sandwich-, and Society-islands.

2. **Myripristis kaianus** Gthr.

Myripristis kaianus Günther, Challenger Rep. Zoology, I. Shore Fishes 1880, p. 39; ibid. XXII. 1887, p. 35.

D. XI. 1.13; A. IV. 11; L.l. 29; L. tr. $\frac{2\frac{1}{2}}{1}$. $\frac{}{7}$

"The height of the body is rather more than the length of the head, and onehalf of the total (without caudal). The diameter of the eye is two-sevenths of the length of the head, and twice the width of the interorbital space which is convex. The maxillary reaches to below the hind margin of the eye, and is not denticulated. Scales deeply serrated, those above the lateral line with acute long spines. Opercles covered with series of spines; opercular spine strong, of moderate length. The third dorsal spine is the longest, nearly half as long as the head; the third anal spine much stronger and also longer than the fourth, and much longer than the opercular spine. Reddish-pink, with a silvery line along each series of scales. Length of specimen 187 mm.". (After GÜNTHER, not seen by us).

Habitat: Kei Islands, 252 M.

3. **Myripristis pralinius** C. V. [Fig. 69, pag. 251].

Myripristis pralinius Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 170.
Myripristis seychellensis Cuvier & Valenciennes, l. c. p. 172.
Myripristis borbonicus Cuvier & Valenciennes, ibid. VIII. 1831, p. 489.
Myripristis pralinius? Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 234. — ibid. III. 1852, p. 262.
Myripristis pralinius Günther, Cat. Brit. Mus. I. 1859, p. 20.
Myripristis bleekeri Günther, l. c.
Myripristis Bleekeri Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 181.
Myripristis indicus Bleeker, l. c. p. 183.

Myripristis multiradiatus Günther, Südsee-Fische I. 1873—1875, p. 93.
Myripristis seychellensis Sauvage, Poissons de Madagascar, 1891, p. 12.
Myripristis pralinius Sauvage, l. c. p. 17.
Myripristis multiradiatus Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 149.
Myripristis pralinius Jordan & Seale, Bull. Bureau Fish. XXV. (1905), 1906, p. 222.
Myripristis multiradiatus Jordan & Seale l. c.
Myripristis pralinius Evermann & Seale, ibid. (1906) 1907, XXVI. p. 60.
Myripristis pralinius Steindachner, Sitzber. Akad. Wien CXV. 1906, p. 1374.
Myripristis pralinius Kendall & Radcliffe, Mem. Mus. Comp. Zool. Harvard Coll. XXXV. N° 3, 1912, p. 90.
Myripristis multiradiatus Kendall & Radcliffe, l. c. p. 93.
Myripristis indicus M. Weber, Siboga Exp. Fische 1913, p. 187.

D. X. 1.15—17; A. IV. 12—15; P. I. 14; V. I. 7; L.l. 36—40; L. tr. $\frac{2\frac{1}{2}}{1}$.
$\frac{}{7}$

Height 2.3—2.7, 2.8—3.5 in length with caudal. Head 3—3.1, 3.8—4.1 in length with caudal. Eye 2.1—2.4. Snout equal to half eye or more. Interorbital space about three fifths of eye, 3.1—3.5 in head. Maxillary reaching to below hind-margin of pupil, its posterior edge with coarse distant rounded teeth, its height posteriorly equal to half eye. Teeth on tongue generally wanting (see note). Origin of dorsal separated by 8 or 9 scales from occiput. Third dorsal spine longest, equal to eye and snout or shorter, about twice as long as spine of second dorsal. Third anal spine longest, equal to postorbital part of head or somewhat longer. Pectorals equal to head without snout, longer than ventrals. Ventral spine equal to eye, almost twice as long as that of pectoral. Caudal deeply forked. Least height of caudal peduncle more than half eye. Colour of alcohol specimens reddish brown with golden reflections and with more or less distinct silvery broad longitudinal bands on the body, corresponding to the rows of scales. Length over 160 mm.

Habitat: Simalur!; Celebes (Kema); Binongka!; Sangir-islands; Ternate; Ambon; Ceram; Banda!; New Guinea (Doreh). — Madagascar, Seychelles, Bourbon, Mauritius, Red Sea, Ceylon, Philippines, eastwards to Paumotu islands.

Note. A good deal of confusion exists about this species. BLEEKER described specimens with some doubt as belonging to *M. pralinius* C. V. but GÜNTHER was of opinion that

BLEEKER's specimens belonged to another species and called it *M. bleekeri*, without having seen specimens apparently. At the same time GÜNTHER described what he thought to be the real *M. pralinius*. BLEEKER afterwards shared GÜNTHER's opinion in regard of *M. bleekeri* but expressed his view that GÜNTHER's *pralinius* neither was the same as that of CUVIER and VALENCIENNES and therefore called it *indicus* without having seen the specimens however. SAUVAGE reexamined the different types of CUVIER and VALENCIENNES and came to the conclusion, that GÜNTHER's *pralinius* (= *indicus* Blkr.) is the same as *M. seychellensis* C. V. and that *M. bleekeri*, as described by GÜNTHER, is identical with *M. pralinius* C. V.

We are of opinion, that these two species from CUVIER & VALENCIENNES can not be separated. The differences mentioned by SAUVAGE and based on few specimens only, are not of specific value. In our collection we have specimens, which agree with *pralinius* in the ramifications of the ridges on the vertex and with *seychellensis* in the width of the palatine band of teeth. Moreover SAUVAGE contradicts his own opinion by saying that a specimen of BLEEKER's collection, received as *M. bleekeri* could not be distinguished from the type *M. pralinius*, whereas he ranged *bleekeri* after GÜNTHER's description (copied from BLEEKER!) under *seychellensis*. As in other species of *Myripristis*, there is a good deal of variation in the number of scales in the lateral line and in that of soft rays in dorsal and anal. GÜNTHER's *M. multiradiatus* belongs certainly to this species too.

There is one point, which still needs elucidation. BLEEKER says that *M. bleekeri* differs from all the species of *Myripristis* in his collection, by having teeth on the tongue. We examined 5 specimens of *M. bleekeri* from BLEEKER's collection in the Leiden Museum and found only in one specimen, long 162 mm. and the largest one BLEEKER possessed, a small patch of teeth near the point of the tongue. All the others had a smooth tongue, the copulae only being toothed. This specimen differs from the others in one other point viz. in the presence of a few knob-like teeth on each side of the chin, in the same manner as occurs, but much stronger developed, in *M. macrolepis*. BLEEKER mentions these teeth in his description of *bleekeri*, saying: "mento antice laevi vel dentibus obtusis scabro". As we could not find any further difference between this specimen

and the others, we are not inclined to separate *bleekeri* from *pralinius* for the moment, but only want to draw the attention on this point.

4. Myripristis hexagonus Lac.

Lutjanus hexagonus Lacépède, Hist. Nat. Poissons IV. 1802, p. 123.
Myripristis hexagonus Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 171. — ibid. VII. 1831, p. 489.
Myripristis hexagonus Quoy & Gaimard, Zool. Voyage Astrolabe. 1826—1834, p. 674.
Myripristis hexagonus Günther, Cat. Brit. Mus. I. 1859, p. 27.
Myripristis Pahudi Bleeker, Versl. Kon. Akad. Amsterdam XV. 1863, p. 22. — Ned. Tijdschr. Dierk. IV. 1873, p. 183.
Myripristis hexagonus Sauvage, Poissons de Madagascar, 1891, p. 22.

D. X. 1.14; A. IV. 12; P. I. 14; V. I. 7; L.l. 35—36; L. tr. $\frac{2\frac{1}{2}}{1\ \ \ }$.
$\overline{6\frac{1}{2}\ (7)}$

Oblong. Height 2.3, 3—3.1 in length with caudal. Head 2.9, 3.7—3.8 in length with caudal. Eye 2.3. Interorbital space about $^2/_3$ of eye, 3.2—3.3 in head. Snout equal to half eye. Maxillary reaching to below posterior half of eye, its lower border at posterior edge with some distant, well developed blunt spinelets, its height posteriorly more than half eye. No teeth on tongue. Origin of dorsal separated by 8 scales from occiput. Third or third and fourth dorsal spines longest, somewhat longer than eye, twice as long as spine of second dorsal or somewhat shorter. Third anal spine longest, stronger than fourth one and equal to or longer than eye and snout. Pectorals almost or quite as long as head, much longer than ventrals. Ventral spine equal to or longer than eye, longer and stronger than that of pectoral. Caudal deeply forked. Least height of caudal peduncle more than half eye. Gillrakers long, slender, numerous. Colour of alcohol specimens reddish yellow, with silvery longitudinal bands corresponding to the rows of scales. Length 183 mm.

Habitat: Celebes (Makassar!); Binongka!; Buru; Ambon; New Guinea. — Mauritius [1]).

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1) The species shortly described by Jordan & Seale (Bull. Bur. Fish. XXV. (1905) 1906, p. 221) as *M. hexagonus* from Samoa, is most probably different.

Note. This species is closely allied to *M. pralinus*. It differs principally by a longer maxillary, which is also higher posteriorly, much higher indeed as in any other species of *Myripristis*, as has already been observed by CUVIER and VALENCIENNES and SAUVAGE. The redescription of the specimens examined by CUVIER and VALENCIENNES and by SAUVAGE agrees with that of BLEEKER for *M. pahudi*.

5. Myripristis trachyacron Blkr.

Myripristis trachyacron Bleeker, Versl. Akad. Amsterdam XV, 1863, p. 24. — Ned. Tijdschr. Dierk. IV. 1873, p. 185.

D. X. I.15; A. IV. 13; P. I. 14; V. I. 7; L.l. 32; L.tr. $\frac{2\frac{1}{2}-3}{\frac{1}{7}}$.

Height 2.5, 3.2 in length with caudal. Head 2.9, 3.7 in length with caudal. Eye 2.2. Snout 2.7 in eye. Interorbital space 1.4 in eye and 3.1 in head. Upperside of head quite different from that of other species of *Myripristis* from this region. The frontals, which divide to form a fontanel in the interorbital region have in stead of the few ridges, separated by a smooth interspace, an arborescent relief, which covers the whole bone, the upper side of the head being therefore completely rough. Maxillary reaching to below posterior part of eye, its lower posterior edge with coarse, tubercular teeth, much more developed than in other species. Teeth in jaws rather large. A conspicuous patch of teeth on each side of chin, below the usual patches in the lower jaw. No teeth on tongue. Origin of dorsal separated by about 8 scales from occiput. Third to fifth dorsal spines the longest, longer than postorbital part of head, but shorter than head without snout. Third anal spine very strong and much longer than fourth, equal to eye and snout. Pectorals shorter than ventrals, equal to head without snout. Ventral spine equal to eye and snout. Least height of caudal peduncle 1.5 in eye. Gillrakers long and slender, about 30 on lower branch of first arch. Colour in alcohol uniform reddish brown. Length of single specimen known 159 mm. [Type in the Leiden Museum seen by us].

Habitat: Ambon!.

Note. This species is easily distinguished by the sculpture of the upperside of the head and the long third anal spine.

6. Myripristis melanostictus Blkr.

Myripristis botche Bleeker, Verh. Bat. Gen. XXII. 1849, Perc. p. 52 (nec C. V.?)
Myripristis hexagonus? Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 262. — Enum. Spec. Piscium 1859, p. 3 (nec. C. V.).
Myripristis melanostictus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 237. — ibid. IV. 1873, p. 187.
Myripristis botche Kner, Novara Exp. Fische, I. 1865—1867, p. 5 (nec C.V.?).
Myripristis macrolepis Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 195.
Myripristis melanostigma Bleeker, Atl. ichth. IX. 1877. Tab. CCCLV. fig. 3 (errore).
Myripristis macrolepis Evermann & Seale, Bull. Bur. Fisheries XXVI. (1906) 1907, p. 60.
Myripristis macrolepis Snyder, Proc. U. S. Nat. Mus. XLII. 1912, p. 495.
Myripristis macrolepis M. Weber, Siboga Exp. Fische 1913, p. 186.

D. X. 1.14; A. IV. 12—13; P. 1.14; V. 1.7; L.l. 27—29; L. tr. $\frac{2\frac{1}{2}—3}{1}$.
7

Height 2.2—2.5, 2.9—3 in length with caudal. Head 2.7—2.9, 3.5—3.7 in length with caudal. Eye 2.1—2.3. Interorbital space about one half of eye, 4.3—5.2 in head. Snout two fifths or one half of eye. Maxillary reaching to below posterior half of eye, its lower border at posterior edge with a series of rounded teeth. Outer row of teeth in upper jaw enlarged and rounded at tip, the others less pointed and more granular than in other species. A patch of strong rounded teeth on each side of symphysis of lower jaw and another one on each side of chin, below those just mentioned. No teeth on tongue. Origin of dorsal separated by 8 or 9 scales from occiput. Third or third and fourth dorsal spine longest, equal to or somewhat longer than eye, less than twice as long as spine of second dorsal. Third anal spine stronger but generally not much longer than fourth one, equal to postorbital part of head or somewhat longer. Pectorals and ventrals subequal, somewhat shorter than head without snout. Ventral spine equal to or longer than eye, much longer than pectoral spine. Caudal deeply forked. Least height of caudal peduncle more than half eye. Colour of alcohol specimens reddish with golden or silvery reflections. Fins yellowish. In the type specimen the body and fins have irregularly arranged large black patches (see below). Length over 200 mm. [Type of *M. melanostictus* and specimens of *M. macrolepis* of BLEEKER's collection in the Leiden and Amsterdam Museum seen by us].

Nomen indig.: Mas laut, Sowangi (Malay Batavia).

Habitat: Nias; Java (Batavia!, Patjitan); Borneo (Tandjong Pandan!); Celebes (Makassar!); Flores!; Buru!; Ambon; Ternate!. — Philippines and Japan.

Note. We have examined the type of *M. melanostictus* in the Leiden Museum. It is nothing but a melanistic variety of *M. macrolepis*. The figure in BLEEKER's Atlas (under the name of *melanostigma*) gives a good idea of the quaint colouration of this fish. Crowded melanoblasts form patches on different parts of the body, on the finmembranes and inside the mouth. Even some of the gillrakers are black. In other respects it is exactly as *M. macrolepis*, and as it has been described first, the name *melanostictus* has to be applied to this species.

M. melanostictus is close to *M. murdjan*. It differs by having a much stronger developed dentition. Whereas in the lastnamed species there are generally only a few enlarged teeth in the outer row of the upper jaw, corresponding to the patch in the lower jaw, the whole series is enlarged in *melanostictus*. KNER and one of us has directed attention to the patches of teeth on the chin. These form a characteristic feature of the species, but they are sometimes developed in *murdjan* too. We have examined a large specimen of *murdjan* from British India, which shows some teeth on the chin, although much less than in the numerous specimens of *M. macrolepis* seen by us. FOWLER (Proc. Acad. Nat. Sc. Philad. LVI. 1904, p. 222) describes in a specimen of *murdjan* from Padang, besides the patches of teeth near the symphysis, a patch: "also on lower surface of each ramus". It is however possible that his specimen was not *murdjan* but *macrolepis*.

7. Myripristis murdjan (Forsk.).

Sciaena murdjan Forskål, Descript. Animal. 1775, p. 48.
Perca murdjan Bloch Schneider, Systema Ichthyol. 1801, p. 86.
Perca murdjan Lacépède, Hist. Nat. Poissons IV. 1802, p. 396 et p. 418.
Myripristis murdjan Rüppell, Atlas Reise N. Afrika, Fische 1826—1831, p. 86.
Myripristis parvidens Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 173.
Myripristis murdjan Cuvier & Valenciennes, l. c. p. 177.
? *Myripristis botche* Cuvier & Valenciennes, l. c. p. 180.
Myripristis violaceus Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 234.

Myripristis parvidens Bleeker, ibid. III. 1852, p. 260. — Ned. Tijdschr. Dierk. IV. 1873, p. 190.
Myripristis microphthalmus Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 261.
Myripristis adustus Bleeker, ibid. IV. 1853, p. 108.
Myripristis murdjan Bleeker, l. c. p. 109.
Myripristis murdjan Günther. Cat. Brit. Mus. I. 1859, p. 21.
Myripristis murdjan Kner, Novara Exp. Fische, 1865—1867, p. 4.
Myripristis murdjan Klunzinger, Verhandl. zool. bot. Ges. Wien XX. 1870, p. 726.
Myripristis murdjan Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 188.
Myripristis microphthalmus Bleeker, l. c. p. 191.
Myripristis violaceus Bleeker, l. c. p. 192.
Myripristis adustus Bleeker, l. c. p. 193.
Myripristis murdjan Günther, Fische der Südsee II. 1873—1875, p. 92.
Myripristis murdjan Klunzinger, Fische des Rothen Meeres I. 1884, p. 77.
Myripristis Murdjan Vaillant, Bull. Soc. Philom. (7) XI. 1887, p. 59.
Myripristis botche Day, Fishes of India 4°, 1878—1888, p. 169; Suppl. p. 788.
Myripristis murdjan Day, l. c. p. 170.
Myripristis murdjan Sauvage, Poissons de Madagascar, 1891, p. 20.
Myripristis murdjan Seale, Occas. Pap. Bishop B. P. Mus. Hawaii, I. 1901, p. 67.
Myripristis murdjan Steindachner, Denkschr. Akad. Wien LXXI. 1902, p. 140.
Myripristis murdjan Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 152.
Myripristis murdjan Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 220.
Myripristis adustus Jordan & Seale, l. c.
Myripristis microphthalmus Jordan & Seale, l. c.
Myripristis murdjan Evermann & Seale, ibid. XXVI. (1906) 1907, p. 60.
Myripristis microphthalmus Evermann & Seale, l. c. [1]).
Myripristis murdjan Steindachner, Sitzber. Akad. Wien CXV. 1906, p. 1373.
Myripristis murdjan Jordan & Richardson, Bull. Bureau Fisheries XXVII. (1907) 1908, p. 247.
Myripristis murdjan Tanaka, Fishes of Japan, IV, 1911, p. 53.
Myripristis microphthalmus Kendall & Radcliffe, Mem. Mus. Comp. Zool. Harvard Coll. XXXV. 1912, p. 90 (partim?).
Myripristis parvidens M. Weber, Siboga Exp. Fische 1913, p. 185.
Myripristis murdjan M. Weber, l. c. p. 186.
Myripristis microphthalmus M. Weber, l. c.
Myripristis adustus de Beaufort, Bijdragen tot de Dierkunde 1913, p. 110.
Myripristis murdjan Jordan & Starks, Ann. Carnegie Mus. vol. XI, Nos. 3—4, 1917, p. 447.
Myripristis murdjan Barnard, Ann. S. Afric. Mus. XXI. 1925, p. 367.

D. X. 1.14—15 (16); A. IV. 12—13 (14); P. 1.14; V. 1.7; L.l. 28—30; L. tr. $\frac{2\frac{1}{2}}{1}$.
$\overline{7}$

Height 2.1—2.7, 2.7—3.5 in length with caudal. Head 2.5—

1) „Eye 7 in head" must be a misprint.

3.2, 3.4—4.4 in length with caudal. Eye 2—2.5. Interorbital space twice or less in eye, 3.2—5 in length of head, comparatively narrower in older specimens than in young ones. Snout equal to or less than half eye. Maxillary reaching to below hindborder of eye or not so far, with or without denticulations near the posterior edge of its lower border; sometimes present at one side and absent in the other in the same specimen. Two groups of stout truncate teeth anteriorly on lower jaw near symphysis. Outer row of teeth of upper jaw enlarged and rounded, especially a group at some distance from symphysis. No teeth on tongue. Origin of dorsal separated by 7 to 9 scales from occiput. Third and fourth dorsal spine subequal, longer than the others, equal to eye or somewhat longer, less than twice as long as spine of second dorsal. Third anal spine stronger, but generally not much longer than fourth one, equal to eye or somewhat shorter. Pectorals longer than ventrals, about equal to head without snout. Ventral spine much longer than that of pectoral, equal to or longer than eye. Least height of caudal peduncle more than half eye. Gillrakers long, slender, numerous. Colour of alcohol specimens yellowish brown, more or less silvery below. The posterior membrane of the operculum more or less blackish, axil of pectorals often black too. In many specimens, especially young ones, there is a blackish or dusky streak through anterior part of dorsal and anal, parallel to the frontborder of these fins, as well as a subterminal marginal along upper and lower border of caudal. These streaks may be accompanied on the three fins by a marginal white streak. In the variety *adustus* the black pigment is much more developed, the upper border of second dorsal and anal as well as the hindborder of the caudal being widely bordered with black. The membrane of the spinous dorsal in this variety is often black, with a median white longitudinal band. Length over 280 mm. [Specimens of *M. parvidens*, *violaceus*, *microphthalmus* of BLEEKER's collection and a specimen of *murdjan* from RÜPPELL's collection seen by us in the Leiden Museum].

Habitat: Pulu Weh!; Simalur!; Batu-Islands; Java (Batavia!); Celebes (Badjoa, Menado, Gorontalo); Sangir-islands!; Karkaralong-islands!; Talaut-islands!; Buton!; Binongka!; Flores!; Rotti!; Letti; Buru; Ambon!; Ceram; Goram; Ternate; Halmahera; Gébé; Batjan; Banda; Timor!; New-Guinea. —

From Madagascar, the East coast of Africa and the Red Sea to South Japan and eastwards to the Sandwich-islands and Paumotu-islands.

Note. GÜNTHER (Fische der Südsee l. c.) has already ranged *M. adustus* Bleeker as a colour-variety under *M. murdjan*. We agree with him and later authors. We have also united *M. parvidens* C. V. with the present species. VALENCIENNES as well as other authors have given the lack of denticulations on the border of the maxillary as chief characteristic of this species. This is a very variable character; in a series of specimens of *murdjan* we find all gradations between well developed denticulations and total loss of them, right and left maxillary being often unequal in this respect and SAUVAGE (Poissons de Madagascar p. 17), has stated that even in the type-specimen there are strong denticulations on the maxillary of one side.

We have also united *M. microphthalmus* and *violaceus* with *M. murdjan*. BLEEKER has laid to much stress on the colouration when separating *microphthalmus* from *murdjan*. There is no difference in the number of dorsal rays as BLEEKER says, even in one of the three typical specimens of BLEEKER the dorsal has only 14 soft rays. When comparing specimens of equal length, there is no difference in the width of the interorbital space either.

M. violaceus cannot be distinguished from *M. murdjan*. We refer to the note under *M. melanostictus* for the differences between this species and *M. murdjan*.

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6. Family MELAMPHAIDAE.

Body compressed, deep or more or less elongate. Head large, with large, mucous cavities. Teeth in jaws. Palate edentulous. Dorsal and anal with a few graduated spines. Ventrals thoracic, with a spine and six to nine soft rays. Caudal forked. Scales from very large and cycloid to small and reduced to minute asperities. Alisphenoids widely separated, extending forward between the orbits but apparently not bridged by an orbitosphenoid.

Deep sea fishes from Atlantic, Indic and Pacific.

1. Melamphaës.

(Günther, Cat. Brit. Mus. V. 1864, p. 433).

Metopias Lowe, Proc. Zool. Soc. London 1843, p. 90 (preoccupied).
Plectromus Gill, Proc. U. S. Nat. Mus. VI. 1883, p. 257.

Body somewhat compressed. Head rather large; with nearly all the superficial bones modified into wide muciferous channels. Eyes moderate or small. Mouth rather large. Lower jaw somewhat prominent. Small pointed teeth in one or two rows in jaws, none on palate or tongue. Opercles not armed. Dorsal with two to six spines and nine to sixteen soft rays. Anal with one or two spines and six to ten soft rays, below or behind posterior half of dorsal. Pectorals long. Ventrals with one spine and seven soft rays. Caudal forked. Scales very large or moderate cycloid, deciduous, also covering the base of the median fins. Eight branchiostegals. Pseudobranchiae and gillrakers present. Gillopening wide.

Deep sea fishes from Atlantic, Indic and Pacific.

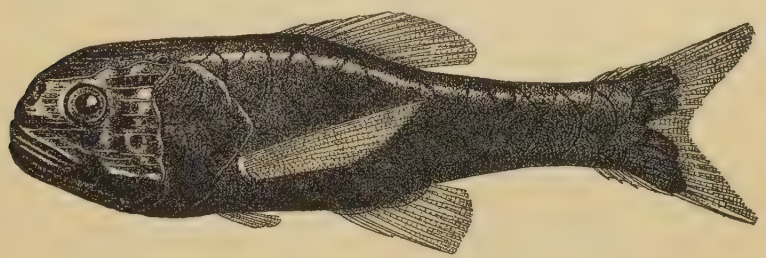

Fig. 70. *Melamphaës mizolepis* Gthr. About n. s. After Brauer.

Key to the indo-australian species of Melamphaës.

A. Scales very large. L.l. 14—18. D. III. 10—11 . . . . *M. mizolepis* p. 263.
B. Scales moderate. L.l. 25—28. D. II—III. 11—12.
  a. Eye 5—6. L.l. 25 . . . . . *M. malayanus* p. 264.
  b. Eye 7. L.l. 28 . . . . . *M. crassiceps* p. 264.

1. Melamphaës mizolepis Gthr. [Fig. 70].

Scopelus mizolepis Günther, Ann. Mag. Nat. Hist. II. 1878, p. 185.
Melamphaës mizolepis Günther, Rep. Challenger, Zool. XXII. 1887, p. 28.
Melamphaes mizolepis Alcock, Ann. Mag. Nat. Hist. (6) VI. 1890, p. 201. — Journ. Asiat. Soc. Bengal LXV. 1896, p. 314. — Descr. Cat. 1899, p. 37.
Melamphaes mizolepis Brauer, Deutsche Tiefsee Exp. Tiefseefische 1906, p. 280.
Plectromus mizolepis Barnard, Ann. South Afric. Mus. XXI. 1925, p. 368.

D. III. 10—11; A. I. 8; P. 12—14; V. I. 7; L.l. 14—18.

Height 3.5—3.7 in length (without caudal). Head about 2.5. Eye 5.2—7, 1.3—1.5 in snout and 2.8—3 in interorbital space. Cleft of mouth rather oblique, the maxillary reaches to below the anterior portion of the eye, and is moderately dilated behind. Origin of dorsal somewhat nearer to snout than to base of caudal and behind the base of the pectorals. Anal beginning about below middle of dorsal and reaching somewhat further posteriorly than that fin. Pectorals long, extending at least to middle of anal fin or even surpassing it somewhat. Origin of ventrals slightly before that of pectorals. Scales large, deciduous, irregularly arranged in the anterior part of the body. Colour blue gray. Length 125 mm. [1]). [After GÜNTHER and BRAUER, not seen by us].

Habitat: Westcoast of Sumatra (1100 M.); off the Aru-Islands (1440 M.). — Deep Sea of Atlantic, Indic and Pacific in depths to 4000 M.

2. Melamphaës malayanus M. Web.

Melamphaes malayanus M. Weber, Siboga Exp. Fische 1913, p. 187.

D. II. 12; A. I. 8; P. 12; V. I. 8; L.l. about 25.

Height 3.5, head 2.7. Eye 5.6, 1.6 in snout and 2.3 in interorbital space. Mouth reaching to below hindermargin of eye. Origin of dorsal slightly nearer to snout than to base of caudal. Origin of anal below ninth soft dorsal ray. Origin of ventrals below that of pectorals. Ventrals reaching almost anus. Pectorals as long as head without snout and reaching far on anal, perhaps even surpassing it. Colour of alcohol specimens, which have lost their scales, coffee-brown with black head and colourless fins. Length 23 mm. [Type in the Amsterdam Museum].

Habitat: Manipa-strait (1536 M.)!; Banda sea (1500 M.!).

3. Melamphaës crassiceps Gthr.

Scopelus crassiceps Günther, Ann. Mag. Nat. Hist. II. 1878, p. 185.
Melamphaës crassiceps Günther, Rep. Challenger Zool. XXII. 1887, p. 28.
Plectromus crassiceps Goode & Bean, Ocean. Ichthyol. 1895, p. 180.

D. III. 12; A. I. 8—9; P. 14; V. I. 7; L.l. 28.

Height 4, head 3. Eye 7, twice in snout. Lower jaw slightly prominent. Cleft of mouth rather oblique. Maxillary reaching

1) According to BARNARD (l. s. c.).

to behind eye. Origin of dorsal nearer to extremity of snout than to caudal fin, and immediately behind the base of the ventrals; its last ray is above the anterior anal rays. Pectoral narrow, nearly as long as the head, reaching to or beyond the end of the anal. Colour black. Length nearly 170 mm. [After GÜNTHER, not seen by us].

Habitat: North of New Guinea (1980 M.). — Atlantic and Indic (1215—2700 M.).

Note. GOODE and BEAN, Oceanic Ichthyol. 1895, p. 180 have mixed the localities of *M. crassiceps* and *M. robustus* as given by GÜNTHER. *M. robustus* therefore is stated to occur North of New Guinea, whereas GÜNTHER mentions only one specimen of this species from the Mid-Atlantic.

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7. Family CAPROIDAE.

Body deep, compressed. Scales small, ctenoid, sides of head scaly. No bony plates or serrations on the belly. Mouth moderate or small, lower jaw projecting. Upper jaw very protractile. Teeth small, in bands in jaws and sometimes on vomer. Dorsal with seven to nine spines. Anal with two to three spines. Ventrals thoracic, with one spine and five soft rays. Caudal rounded. Alisphenoids united with each other and separating the upper and lower parts of the anterior opening to the brain cave. Orbitosphenoid absent. Coracoid reaching the ventral profile, embracing the pelvic bones, which fail to reach the anterior edge of the cleithra by some distance. 21—23 vertebrae. Branchiostegals six.

Distribution: All tropical and subtropical seas.

1. Antigonia Lowe.

(LOWE, Proc. Zool. Soc. London 1843, p. 85).

Hypsinotus Schlegel, Fauna Japonica, Poissons 1847, p. 84.

Body very deep, profile from nape to dorsal very steep: surface of head above with rough bony striae; praeoperculum and suborbital bones serrated. Teeth in jaws only, none on palate. Dorsal with seven to nine spines and 26—38 soft rays. Anal with three spines and 25—35 soft rays. Caudal rounded. Pectorals pointed. Ventrals at lowest part of abdominal profile,

opposite origin of dorsal or nearly so. Scales ctenoid, rough, about 50—60 in the lateral line. All tropical and subtropical seas.

Key to the indo-australian species of Antigonia.

1. D. IX. 26—28, mouth nearly horizontal . . . . . *A. rubescens* p. 266.
2. D. VIII. 28—29, mouth nearly vertical . . . . . *A. malayana* p. 267.

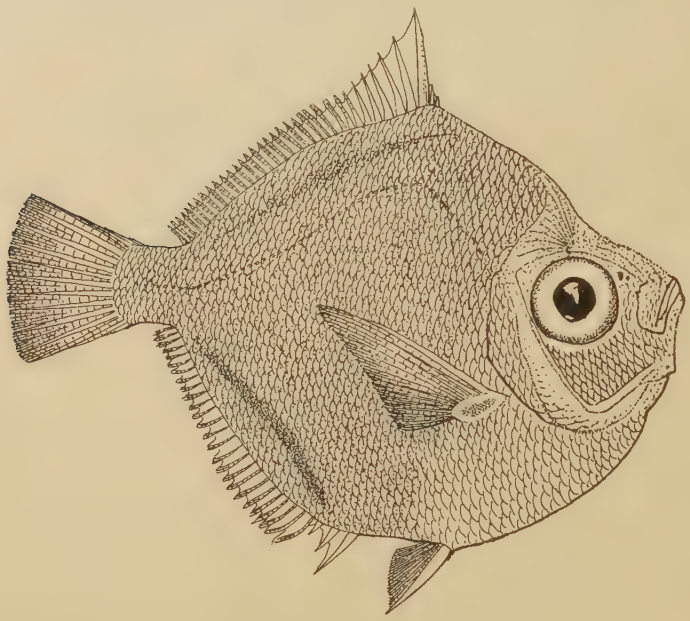

Fig. 71. *Antigonia malayana* M. Weber × 1.

1. Antigonia rubescens (Gthr.).

Hypsinotus spec. Schlegel, Fauna Japonica 1847, p. 84.
Hypsinotus rubescens Günther, Cat. Brit. Mus. II. 1860, p. 63.
Antigonia rubescens Günther, Challenger Rep. VI. Shore fishes 1880, p. 44, p.p.
Antigonia capros Günther, Challenger Rep. XXII. 1887, p. 44, p.p.
Antigonia capros Alcock, Descriptive Catalogue 1899, p. 44.
Antigonia rubescens Jordan & Fowler, Proc. U. S. Nat. Mus. XXV. 1902, p. 523.
Antigonia rubescens Franz, Abh. II. Kl. Kön. Akad. Wissenschaften München Suppl. Bd. 1. Abth. 1910, p. 58.
? *Antigonia fowleri* Franz, ibid.
Antigonia rubescens M. Weber, Siboga Exp. Fische 1913, p. 299.
Antigonia rubescens Barnard, Ann. S. Afric. Mus. XXI. 1925, p. 380.

D. IX. 26—28; A. III. 25—27; P. I. 12; V. I. 5; L.l. 55—60; L.tr. $\frac{14}{40}$.

Height 1—1.16, 1.37—1.11 in total length, generally less high in larger than in smaller specimens. Head 2.3—2.7, 2.8—3.2 in length with caudal. Eye nearly 3, equal to snout. Mouth small, nearly horizontal. Six horizontal and about 15 vertical rows of scales on cheeks. First and second dorsal spine minute, third by far the longest, compressed, striated, equal to snout and eye or longer; the following decreasing gradually in length. Base of soft dorsal slightly longer than that of soft anal. First anal spine longer and thicker than the two following ones, equal to eye or shorter. Pectorals equal to or longer than snout and eye. Ventral spine strong, longer or shorter than head without snout. Colour of alcohol specimens brownish, silvery below, a longitudinal greyish streak at some distance below base of dorsal and above that of anal not always distinct. Length over 160 mm.

Habitat: Celebes (Menado); Arafura-sea (204 and 304 M.)!; near Kei Islands (232 M.). — Coast of Japan (68—1130 M.), Off Ceylon, Trincomali and Malabar coast, Natal Coast (288—368 M.).

2. **Antigonia malayana** M. Web. [Fig. 71, p. 266].

Antigonia malayana M. Weber, Siboga Exp. Fische 1913, p. 299.

D. VIII. 28—29; A. III. 25—27; P. I. 12; V. I. 5; L.l. 53—55; L.tr. $\frac{10}{1}\frac{}{30—32}$.

Height 1.5—1.68 in total length. Head about 3.7 in total length. Eye 2.5. Mouth nearly vertical, as well as lower jaw. Snout two thirds of eye. Praeorbital with a serrated ridge anteriorly. Four to five horizontal and about sixteen vertical rows of scales on cheeks. Praeoperculum and operculum serrated. Origin of dorsal in vertical through anus; first and second dorsal spines minute, third as long as half head, the following ones decreasing in seize gradually. Anal spines short, the first somewhat more than half eye. Ventrals reach anal spines in males only. Pectorals as long as head. Caudal feebly rounded. Colour in life red with the belly silvery; brownish in alcohol specimens, sometimes with a subbasal dark streak along dorsal and anal. Length 90 mm. [Type in the Amsterdam Museum].

Habitat: Arafura-Sea (204 and 304 M.)!

Order PERCIFORMES.

Airbladder without an open duct. Parietals separated by the supraoccipital. Orbitosphenoid wanting. No bony stay for the praeoperculum. Opercular bones well developed. Mouth typically protractile. Lower pharyngeals not ankylosed. Dorsal generally well developed, with a spinous part and a soft part. Anal generally with few spines. Pectoral spine normally present. Radials of pectorals four or five in number more or less hour-glass-shaped, longer than broad, one or two of them in contact with the coracoid. Mesocoracoid wanting. Ventrals thoracic,with one spine, exceptionally with two (family Amphacanthidae) and not more than five soft rays. Pelvic bones directly attached to cleithra. Caudal rays not very numerous. Scales generally ctenoid, sometimes cycloid and seldom wanting.

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1. Family KUHLIIDAE.

Spinous dorsal well developed, with ten spines. Anal as much developed as the soft dorsal, with three spines. No subocular lamina of the suborbitals. No parietal crests. First 4 or 5 ribs sessile, inserted below and behind the parapophyses, the following inserted on parapophyses. Vertebrae 10 + 15. Pseudobranchiae present. Four gills, a slit behind the fourth. Pharyngeal bones separate. Teeth villiform. For other characters see those of the single genus.

1. **Kuhlia** Gill.

(GILL, Proc. Ac. Philadelphia 1861, p. 48).

Dules Cuvier & Valenciennes, Hist. nat. Poissons III. 1829, p. 111 (pro parte).
Moronopsis Gill, Proc. Acad. Philadelphia 1863, p. 82.
Paradules Bleeker, Ned Tijdschr. Dierk. I. 1863, p. 257.
Boulengerina Fowler, Proc. Acad. Philadelphia 1906, p. 512 (nec Dollo).
Safole Jordan, Proc. U. S. Nat. Mus. XIII. 1912, p. 655.

Much compressed, oblong or somewhat elongate; scales large or of medium size, ctenoid. Lateral line complete. Mouth

large, protractile, maxillaries without supramaxillary. Teeth in jaws in villiform bands; teeth on vomer, palatines, entopterygoids and ectopterygoids; tongue smooth. Head naked above. Praeorbital and praeoperculum denticulate; operculum with two spines. Gillmembranes separate. Six branchiostegals. Gillrakers long and slender. Dorsal fins connected at the base, the spinous one with ten spines, the soft portion with 9–13 rays and shorter than the first part. Anal as much developed as the soft dorsal, with three spines and 10—12 rays. Dorsal and anal fitting in a well-developed sheath. Caudal emarginate or deeply forked. Pectorals pointed. Origin of ventrals behind that of pectorals, close together, with a spine and 5 soft rays.

Distribution: Coasts of tropical and subtropical parts of Indic and Pacific, but not reaching to Pacific coast of America. Several species also living in fresh water.

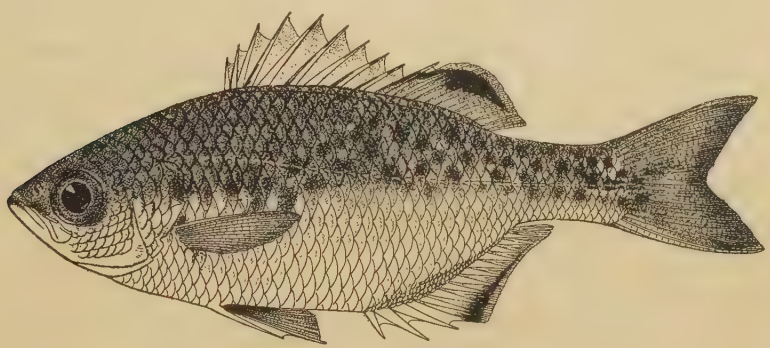

Fig. 72. *Kuhlia marginata* (C. V.) 1/4 n. s.

Key to the indo-australian species of Kuhlia.

I. Ll. 40—45. 16—19 gillrakers on lower part of anterior arch.

1. Maxillary reaching to below middle of eye or farther backwards, its height equal to half eye or almost so. Snout equal to eye. Base of soft part of anal equal to that of soft dorsal . . . . . *K. rupestris* p. 270.

2. Maxillary not reaching to below middle of eye, its height one third of eye. Snout shorter than eye. Base of soft anal longer than that of soft dorsal . *K. marginata* p. 271.

II. Ll. 46—56. 23—26 gillrakers on lower part of anterior arch.

1. Caudal with 5 blackish bands, one median and two on each lobe, converging posteriorly. Ll. 53—56. *K. taeniura* p. 273.
2. Caudal with a broad black marginal band. Ll.46—50. *K. munda* p. 273.

1. Kuhlia rupestris (Lac.).

Centropomus rupestris Lacépède, Hist. Nat. Poissons IV. 1802, p. 252, 273.
? *Perca ciliata* Cuvier & Valenciennes, Hist. nat. Poissons II. 1828, p. 52.
Dules fuscus Cuvier & Valenciennes, ibid. III. 1829, p. 118.
Dules rupestris Cuvier & Valenciennes, ibid. III. 1829, p. 119, ibid. VII. 1831, p. 477.
Dules guamensis Cuvier & Valenciennes, ibid. VII. 1831, p. 474.
Dules vanicolensis Cuvier & Valenciennes, ibid. VII. 1831, p. 478.
Dules rupestris Bleeker, Nat. Tijdschr. Ned. Indië VI. 1854, p. 209.
? *Percichthys ciliata* Günther, Cat. Brit. Mus. I. 1859, p. 62.
Dules rupestris Günther, ibid. p. 269.
? *Kuhlia ciliata* Gill, Proc. Acad. Philadelphia 1861, p. 48.
Paradules rupestris Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 267.
Moronopsis rupestris Bleeker, Arch. Neerl. VII. 1872, p. 379; Atl. ichth. VII. 1873—1876, p. 121.
Dules marginatus Day, Fishes of India 4°. 1878—1888, p. 67 (nec C.V.).
Dules haswellii Macleay, Proc. Linn. Soc. N.S. Wales V. 1880, p. 359.
Dules fuscus Sauvage, Hist. nat. d. Poissons de Madagascar, 1891, p. 149.
Dules rupestris Sauvage, ibid. p. 150.
Dules rupestris Perugia, Ann. Mus. Civ. Genova. Vol. XIII (XXXIII), 1893, p. 251.
Kuhlia rupestris Boulenger, Cat. Brit. Mus. 2nd ed. II. 1895, p. 36.
Kuhlia rupestris hedleyi Ogilby, Proc. Linn. Soc. N.S. Wales XXII. 1897, p. 767.
Kuhlia rupestris Seale, Occas. Papers B. P. Bish. Mus. Hawai I. 1901, p. 75.
Dules rupestris Pietschmann, Jahrb. Nassau. Ver. f. Naturk. in Wiesbaden, 66. Jahrg. 1913, p. 197.
Kuhlia rupestris Tate Regan, Proc. Zool. Soc. London, 1913, p. 375.
Kuhlia rupestris M. Weber & de Beaufort, Nova Caledonia Zool. vol. II. Livr. 1, N°. 2, 1915, p. 41.
Kuhlia rupestris Herre & Montalban, Philippine Journ. Sc. XXXIII, 1927. p. 205.

D. X. 11; A. III. 9—10; P. 2. 11—12; V. I. 5; Ll. 41—44; L.tr. $\frac{4—4\frac{1}{2}}{9—11}$.

Height 2.4—2.7, 3—3.4 in length with caudal. Head 2.9—3, 3.4—3.7 in length with caudal. Eye 3.8—4.5, 1.2—1.4 in convex interorbital space. Snout equal to eye or somewhat longer. Maxillary extending to below middle of eye or farther backwards, its height posteriorly equal to half eye or a little less in small specimens. Sixteen to nineteen gillrakers on lower part of anterior arch. Ten to twelve scales between occiput and dorsal. Fourth or fifth spine of dorsal longest, equal to postorbital part of eye, ninth about $^2/_3$ of tenth. Third anal

spine somewhat longer than second one, equal to or longer than snout. Base of soft part of dorsal equal to that of anal, but lastnamed ending more posteriorly. Pectorals and ventrals subequal, less than head without snout. Ventral spine less than postorbital part of head. Least height of caudal peduncle not much more than its length. Caudal feebly emarginate, the lobes rounded. Lateral line nearly straight. Colour silvery, darker bluish-silvery above, each scale usually with a dark spot, similar spots on opercles and on membrane of anal. Soft dorsal and caudal with a basal and a terminal or subterminal blackish band, lastnamed often represented on caudal by a black patch on each lobe only. Length 400 mm.

Nom. indig.: Gadidi ajer tawar (Batjan), Tjiptjip (Ambon).

Habitat: Simalur!; Pulu Babi!; Engano; Java; Nusa Kembangan!; Celebes (Menado); Sangir islands; Sumba; Timor!; Buru!; Ambon!; Saparua!; Batjan; Talaut islands!; New Guinea (Stephansort). — East Africa, Madagascar, Mauritius, Seychelles, British India; Philippines; Pelew Islands; Carolines, New-Caledonia!, Pacific islands to Paumotu Archipelago.

In fresh water.

2. Kuhlia marginata (C.V.). [Fig. 72, p. 269].

Dules marginatus Cuvier & Valenciennes, Hist. nat. Poissons III. 1829, p. 116. — Ibid. VII. 1831, p. 474.
Dules maculatus Cuvier & Valenciennes, ibid. VII. 1831, p. 475.
? *Dules malo* Cuvier & Valenciennes, ibid. VII. 1831, p. 479 (based on a drawing).
Dules mato Lesson, Voyage Coquille, Zool. II. 1831, p. 223.
Dules leuciscus Jenyns, Zool. Beagle, Fish. 1842, p. 17.
Dules marginatus Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 573.
Dules maculatus Bleeker, ibid. V. 1853, p. 333.
Dules marginatus Günther, Cat. Brit. Mus. I. 1859, p. 268.
Paradules marginatus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 257.
Moronopsis ciliatus Bleeker, Arch. Neerl. Sci. Nat. VII. 1872, p. 376. — Atl. ichth. VII. 1876, p. 120 (nec C. V.).
Dules marginatus Günther, Fische der Südsee I. 1873—1875, p. 24.
Dules papuensis Macleay, Proc. Linn. Soc. N. S. Wales VIII. 1883, p. 257.
Dules marginatus Reuvens, Notes Leyden Mus. XVI. 1894, p. 149 (s. syn.).
Kuhlia marginata Boulenger, Cat. Brit. Mus. 2nd ed. I. 1895, p. 38.
Kuhlia marginata Bryan & Herre, Occas. Pap. B. P. Bishop Mus. Hawaii II. 1903, p. 129.
Kuhlia marginata Ishikawa, Proc. Dept. Nat. Hist. Tokyo Imp. Mus. vol. I, N°. 1, 1904, p. 9.
Kuhlia malo Kendall & Goldsborough, Mem. Mus. Comp. Zool. XXVI. 1911, p. 280.

Kuhlia maculata Kendall & Goldsborough, ibid. p. 281.
Kuhlia marginata Jordan & Thompson, Proc. U. S. Nat. Mus. XLI. 1912, p. 525.
Kuhlia marginata T. Regan, Proc. Zool. Soc. London 1913, p. 378.
Kuhlia marginata M. Weber & de Beaufort, Nova Caledonia II. Livr. 1, N⁰. 2, 1915, p. 30.
Kuhlia malo Herre & Montalban, Philippine Journ. Sc. XXXIII, 1927, p. 202.
Kuhlia marginata Herre & Montalban, ibid. p. 203.

D. X. 10—12; A. III. 11—13; P. 2. 11—12; V. I. 5; L.l. 40—45; L.tr. $\frac{4\frac{1}{2}}{\frac{1}{9—10}}$.

Height 2.5—2.8, 3.1—3.5 in length with caudal. Head 3.4—3.6, 4.2—4.5 in length with caudal. Eye 2.8—3.3. Snout about three fourths of eye. Interorbital space slightly convex, equal to eye. Maxillary extending to below anterior half of eye. Height of maxillary posteriorly about one third of eye. Sixteen to eighteen gillrakers on lower part of anterior arch. Nine or ten scales between occiput and dorsal. Fifth spine of dorsal longest, equal to snout and eye, ninth spine about two thirds of tenth. Third anal spine longer than second, equal to postorbital part of head. Anal reaching farther back than dorsal. The base of its soft part longer than that of soft part of dorsal, in very young specimens the bases of soft dorsal and anal are almost equal. Pectorals and ventrals subequal, as long as head without snout. Ventral spine equal to postorbital part of head. Least height of caudal peduncle about 1.5 in its length. Caudal moderately emarginate, the lobes pointed. Lateral line nearly straight. Colour silvery; brownish above. Usually spotted with blackish on the back, sides, caudal peduncle and caudal, which last has a dark posterior margin. Soft dorsal and anal dark edged. Length 210 mm.

Nòm. indig.: Kissa (Menado); Godidi ajer-tawar, Dewang, Ariwangan (Batjan); Tjiptjip (Ambon).

Habitat: Simalur!; Pulu Babi!; Sumatra (Padang, Trussan, Priaman, Siboga, Benkulen); Nias; Nusa Kembangan!; Java; Bali; Sumba; Timor!; Celebes (Maros, Balangnipa!, Menado, Sawangan, Gorontalo); Talaut islands!; Halmahera!; Ternate; Batjan!; Buru!; Ceram!; Ambon!; Saparua!; Kei-islands!; Dammer!; Waigeu!; Misool; New Guinea (river Mbai!, river Klipong!). — Philippines, Formosa, Japan, Carolines, New Caledonia!, Fiji islands, Samoa, Gilbert Islands, Tahiti.

In fresh water.

3. Kuhlia taeniura (C. V.).

Dules taeniurus Cuvier & Valenciennes, Hist. nat. Poissons III. 1829, p. 114.
Perca argentea Bennett, Fish. Ceylon, 1830, pl. XXII.
Dules taeniurus Bleeker, Verh. Bat. Gen. XXII. 1849, Bijdr. Percoïden, p. 49.
Dules bennetti Peters, Monatsber. Berl. Akad. 1855, p. 432.
Dules taeniurus Günther, Cat. Brit. Mus. I. 1859, p. 267.
Dules bennetti Günther, ibid. p. 270.
Dules taeniurus Kner, Novara Exp. Fische 1865—1867, p. 47.
Dules argenteus Klunzinger, Verh. zool. bot. Ges. Wien XX. 1870, p. 730.
Moronopsis taeniurus Bleeker, Arch. Neerl. VII. 1872, p. 374. — Atl. ichth. VII. 1876, p. 119.
Paradules taeniurus Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 139.
Dules argenteus Günther, Fische der Südsee, I. 1873, p. 25.
Dules argenteus Day, Fishes of India 4°, 1878—1888, p. 67.
Moronopsis argenteus Klunzinger, Fische des Rothen Meeres I. 1884, p. 25.
Kuhlia arge Jordan & Bollman, Proc. U. S. Nat. Mus. XII. 1889, p. 159.
Kuhlia taeniura Boulenger, Cat. Brit. Mus. 2nd ed. 1895, p. 39.
Kuhlia Sterneckii Steindachner, Sitzber. Akad. Wien CVII. 1898, p. 461.
Kuhlia taeniura Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 208.
Kuhlia taeniura Gilchrist & Thompson, Ann. South Afric. Mus. VI. (part 2) 1908, p. 149.
Boulengerina taeniura Jordan & Thompson, Proc. U.S. Nat. Mus. XLI. 1912, p. 522.
Safole taeniura Snyder, ibid. XLII. 1912, p. 497.
Kuhlia taeniura Tate Regan, Trans. Zool. Soc. London, 1913, p. 381.
Kuhlia taeniura Herre & Montalban, Philippine Journ. Sc. XXXIII, 1927, p. 200.

D. X. 10—11; A. III. 11; P. 14; V. I. 5; Ll. 53—56; L.tr. $\frac{5}{1}$.
$\frac{}{14}$

Height 2.6—3, 3.4—3.7 in length with caudal. Head 3.1—3.6, 4.2—4.5 in length with caudal. Eye 2.8—3.3, about equal to convex interorbital space. Snout somewhat shorter than, or equal to eye. Maxillary extending to below frontborder of pupil. Height of maxillary posteriorly about two fifths of eye. Twenty three to twenty six gillrakers on lower part of anterior arch. Twelve to fourteen scales between occiput and dorsal. Fifth spine of dorsal longest, equal to snout and eye or somewhat longer. Ninth spine not much longer than tenth. Third and second anal spine subequal, as long as diameter of eye. Anal reaching a little farther back than dorsal, the base of its soft portion scarcely longer than that of soft dorsal. Pectorals longer than ventrals, equal to head without snout. Ventrals equal to snout and eye or a little shorter. Ventral spine somewhat longer than eye. Least height of caudal peduncle 1.5 in its length. Caudal deeply forked, the lobes pointed.

Lateral line with a very feeble curve anteriorly. Colour of alcohol specimens silvery, with a bluish gloss and brownish above. Fins light yellow. Each lobe of caudal with two broad parallel, oblique black bands, converging posteriorly with those of the other lobe and a somewhat smaller longitudinal one on the median rays. Dorsal with a more or less distinct subterminal blackish band. Length 200 mm.

Habitat: Sumatra (Benkulen); Java (Pagotang, Karangbollong, Bantam); Sumba!; Buru, Sangir Islands. — From east coast of Africa, Madagascar, Mauritius, Seychelles, Laccadives, Sokotra, Red Sea, Ceylon, coast of India to Japan and Australia, Pacific islands to the Revillagigedo Islands. — In fresh and brackish water and in sea on coral reefs.

4. **Kuhlia munda** (De Vis).

Herops munda De Vis, Proc. Linn. Soc. N. S. Wales IX. 1884, p. 392.
Dules humilis De Vis, ibid. IX. 1884, p. 396.
Dules nitens Ramsay & Ogilby, ibid. (2) II. 1887, p. 4.
Kuhlia malo Boulenger, Cat. Brit. Mus. 2nd ed. 1895, p. 40 (pr. parte).
Kuhlia humilis Ogilby, Ann. Queensland Mus. N° 10, 1911, p. 46.
Kuhlia proxima Kendall & Goldsborough, Mem. Mus. Comp. Zool. XXVI. 1911, p. 282.
Kuhlia humilis Tate Regan, Proc. Zool. Soc. London 1913, p. 380. — Ibid. 1914, p. 340.
Kuhlia humilis M. Weber & de Beaufort, Nova Caledonia Zool. vol. II. Livr. I, N° 2, 1915, p. 29.
Kuhlia munda Mc Culloch, Rec. Austr. Mus. XIII. N° 2, 1920, p. 55.

D. X. 11; A. III. 11; P. 1. 12; V. 1. 5; L.l. 46—50; L.tr. $\frac{4}{12}$.

Height 2.5—3, about 3.5 in length with caudal. Head 2.9—3.2, about 4 in length with caudal. Eye 2.5—2.6 in head. Snout one half or two thirds of eye. Interorbital space flat, less than eye. Maxillary not quite extending to vertical through frontborder of pupil, 25 gillrakers on lower part of anterior arch. 14—16 scales between occiput and dorsal. Fourth and fifth dorsal spine longest, equal to snout and eye. Tenth spine equal to seventh, much longer than eighth and ninth spine. Second and third anal spines subequal, the second one the stronger, somewhat more than eye. Base of anal equal to head without snout. Anal ending a little behind dorsal. Pectorals less than head without snout, equal to ventrals. Ventral spine longer than eye. Caudal deeply emarginate, middle rays

somewhat more than half length of longest. Least height of caudal peduncle about 2.5 in head. Lateral line with a gentle curve anteriorly. Silvery, back darker. Base of caudal blackish. Caudal with a broad marginal black band. Length 236 mm.

Habitat: New Guinea (Port Moresby). — Queensland, New Caledonia !, Fiji islands.

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2. Family Apogonidae.

Body oblong or elongate, more or less compressed and sometimes elevated, covered with small or rather large scales, ctenoid on body, on head generally cycloid, sometimes totally cycloid. Cheeks and operculum mostly scaly. Lateral line complete and continuous, seldom incomplete. Head large; mouth rather wide, generally oblique, the mandible more or less prominent. Seven branchiostegals; gillmembranes separate; gillrakers long and numerous or short and few in number. Pseudobranchiae present. Lower pharyngeals separate, with sharp teeth. Praeoperculum with a double edge, which may be entire, crenulated or serrated. Operculum with 1 or 2 weak spines, or with an opercular flap which may be minutely denticulated. Teeth on jaws, vomer and palatines minute or villiform, in bands; on palatines they may be wanting or few. In some genera a pair of canines is present on intermaxillary and symphysis, they may be followed by distant canines. Dorsal fins well separated, the first with 6 to 9 strong or weak spines, the second with one spine and 8 to 10 branched rays; anal with 2 to 3 rather weak spines and 7—17 branched rays. Ventrals thoracic, without axillary scale, with 1 spine and 5 rays. Pectorals with 2 simple rays, the first of which is minute and ten to fourteen branched rays. Exceptionally the spines of second dorsal, anal and ventrals may be serrated. Caudal incised, truncated or rounded. No dorsal sheath or furrow. Vent generally situated at a short distance before anal or somewhat nearer to ventrals till about midway between origin of anal and ventrals, or quite near to lastnamed origin.

Small littoral fishes of warm seas, living also in brackish and

fresh water. Some of them are inhabitants of deep water till about 550 M.

In some genera a bucco-branchial incubation is observed, the male sheltering the agglutinated eggs in his mouth.

Key to the indo-australian Apogonidae.

I. Teeth on vomer, jaws and palatines minute or villiform, no true canines.
  A. Scales on body ctenoid.
    a. Lateral line complete and continuous.
      α. Height of body about equal to or only slightly less than length of head. Operculum without spines or only with a flat one; anal II, 7—17. *Apogon* p. 277.
      β. Height of body more than one third less than length of head. Operculum with 4 short spines; anal II, 8—9 . . . . . *Oxyodon* p. 351.
    b. Lateral line incomplete; anal II, 8 . . . . . *Foa* p. 352.
  B. Scales on body cycloid; linea lateralis complete and continuous.
    a. Anal II, 8—9; gillrakers about 7, short; large opercular scales; a tubelike postanal prolongation of peritoneum above anal . . . . . *Siphamia* p. 355.
    b. Anal II, 9—13; gillrakers numerous (about 22), long; small opercular scales; no tubelike prolongation . . . . . *Rhabdamia* p. 357.

II. Jaws with minute or villiform teeth; at least a pair of intermaxillary or symphysial canines.
  A. Lateral line complete and continuous.
    a. Scales of body ctenoid; anal II, 8; caudal feebly incised; no spines serrated; vent more than half diameter of eye in advance of anal . . . . . *Cheilodipterus* p. 359.
    b. Scales of body cycloid, deciduous.
      α. Anal II, 7; caudal rounded; no spines serrated; vent close to anal . . . . . *Synagrops* p. 366.
      β. Anal III, 7—8; caudal incised; spines of second dorsal, anal and ventrals often serrated; vent close to ventrals . . . . . *Acropoma* p. 367.
  B. Lateral line incomplete; scales small, cycloid; anal II, 8—10; caudal rounded; no spines serrated; vent near origin of anal. . . . . *Pseudamia* p. 370.

1. Apogon Lacépède.

(Lacépède, Hist. Nat. Poissons III. 1802, p. 411).
Amia Gronovius, Zoophyl., 1763, p. 80 [1]).

Body oblong, compressed, covered with large or moderate ctenoid scales, those before dorsal sometimes cycloid. Lateral line continuous. Mouth rather large, more or less oblique.

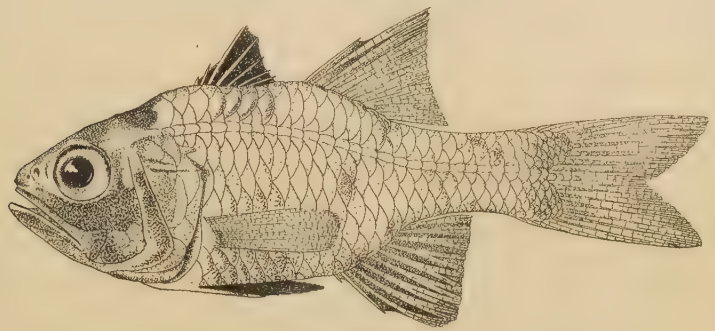

Fig. 73. *Apogon melanopus* M. Web.

Praeoperculum with an inner ridge, which is smooth or serrated. Free border of praeoperculum serrated or smooth. Praeorbital and orbital rim sometimes with serrations, generally smooth or somewhat rough. Operculum generally with a little developed flat spine. Gillrakers spiculated and compressed, short and knoblike on hypobranchiale, much longer on cerato-branchiale, their number varying between 7 and 17. Teeth in bands in jaws and on vomer, present or absent on palatines. No distinct canines in the jaws, caninoid teeth seldom present, the teeth being generally small, pointed or more or less conical. Two dorsals, the first with six or seven spines, abnormally sometimes 8 spines. In case of seven spines, the first spine is small, sometimes minute. Second dorsal at some distance from the first, above the anal and consisting of one spine and about nine soft branched rays. Anal with two spines, the anterior of which is very small and with seven to seventeen soft branched rays. Caudal incised, truncate or rounded. Pectorals with two

Fig. 74. *Apogon hoeveni* Blkr. (The bucco-pharyngeal cavity filled with agglutineted eggs). $1^1/_2 \times$.

1) Nonbinomial.

undivided rays, the first of which is minute and with ten to fourteen branched rays. Ventrals with a spine and five soft rays. Vent situated shortly before anal, or somewhat nearer to ventrals, till about midway between origin of ventrals and anal.

Distribution: Mediterranean, Red sea. Warm parts of Indic, Pacific and Atlantic. Litoral fishes living in sea till about 100 M. depth and in brackish water. Some species living in freshwater.

Key to the indo-australian species of Apogon.

I. Anal with not more than 8—10 soft rays. (*Apogon* s.str.).

A. 4—6 scales between l.l. and first dorsal. D^{I} VI. Caudal truncate or rounded (Freshwater fishes of New Guinea and adjacent islands).

1. L.l. 46—50. A. II. 8. Generally transverse bands on body . . . . . 1. *A. sandei* p. 284.
2. L.l. 39—45. A. II. 9—10. Oblique transverse bands.
   a. First dorsal spine more than one fifth of second. L.l. 40—45 . . . . . 2. *A. gjellerupi* p. 285.
   b. First dorsal spine equal to or less than one fifth of second. L.l. 39—40 . . . . . 3. *A. heurni* p. 286.
3. L.l. 37—38. Body with longitudinal bands. 4. *A. beauforti* p. 287.
4. L.l. 35—37. Three transverse bands . . . . 5. *A. trifasciatus* p. 288.
5. L.l. 25—33. Oblique transverse bands. . . 6. *A. wichmanni* p. 289.

B. 3 scales between l.l. and first dorsal. D^{I} VII. Caudal emarginate.

1. L.l. 35—36.
   a. About 13 narrow longitudinal bands . . 7. *A. multitaeniatus* p. 291.
   b. Two broad longitudinal bands . . . . . 8. *A. kalosoma* p. 292.
2. L.l. 33 (?). Body uniform . . . . . 9. *A. godini* p. 293.

C. $1^{1}/_{2}$—2 scales between l.l. and first dorsal. L.l. 22—28.

c[1]. Seven dorsal spines.
   a. Free margin of praeoperculum serrated. Caudal generally incised.
      a'. Silvery subcutaneous prolongations of peritoneum on tail above anal.
         α. Caudal deeply incised. . . . . 10. *A. tubulatus* p. 293.
         β. Caudal truncate . . . . . 11. *A. argyrogaster* p. 294.

b'. No silvery subcutaneous prolongations of peritoneum.

aa. Vertical part of praeopercular ridge and orbital rim serrated.

α. Height 2.9—3.3. L.l. 25—26. A dark band from snout to caudal. 12. *A. frenatus* p. 295.

β. Height 2.3—2.4. L.l. 23. Seven to eight dark bands from head to caudal. Soft dorsal and anal with a dark ocellus . . . . . 13. *A. brevicaudatus* p. 297.

γ. No bands on body. Second dorsal and anal with a black band along the base, each lobe of the caudal with a blackish streak. Outer margin of ventrals blackish . . . . . 14. *A. taeniopterus* p. 298.

bb. Praeopercular ridge smooth or at most with some spines at angle.

α. Dorsal spines stronger, the third one generally much stronger than the others. Often dark longitudinal bands on the body.

α'. Second dorsal spine one fourth of third; two dark bands on body, separated by a row of pearly spots. Chin blackish . . 15. *A. margaritophorus* p. 299.

β'. Second dorsal spine longer, one third or more of third one.

αα. Maxillary reaching to below posterior half of eye. Dark longitudinal bands, often continued on caudal.

ααα. Two bands on upper part of body only. Orbital rim serrated. P. 2.13—14. . . . . 16. *A. quadrifasciatus* p. 300.

βββ. Bands also on lower part of body, orbital rim without serrations. P. 2.11—12.

1. Snout pointed, three fourths of eye. Height of praeorbital one third of eye. . . . . 17. *A. novemfasciatus* p. 302.

2. Snout blunt, two thirds of eye. Height of praeorbital equal to half eye . . . . . 18. *A. endekataenia* p. 306.

ββ. Maxillary reaching to below middle of eye. Bands, if present, seldom continued on caudal.

ααα. Mouth very oblique. Three stripes on each side in upper part of body . . . . . 19. *A. septemstriatus* p. 307.

βββ. Mouth moderately oblique.

1. Body with two transverse bands. A black streak from snout to eye often present. Spot at base of caudal present or absent. Third dorsal spine very strong . . . . . 20. *A. taeniatus* p. 307.

2. No bands, body and fins dark. A black stripe from eye to praeopercular angle often present. Second dorsal often with a black ocellus. No spot at base of caudal. Spine of second dorsal long and slender. 21. *A. melas* p. 309.

3. Longitudinal dark bands on body more or less distinct. A silvery longitudinal streak below dorsal. No black stripe from eye to praeopercular angle. A dark spot at base of caudal . . . 22. *A. hartzfeldi* p. 311.

4. Longitudinal dark bands on body may

be present. No silvery streak below dorsal. No black stripe from eye to praeopercular angle. A dark spot at base of caudal . . . 23. *A. chrysopomus* p. 312.

5. Body with more or less distinct longitudinal bands. No black streak from eye to praeopercular angle. Head dark, with silvery longitudinal streaks from snout through eye to operculum. No spot at base of caudal. . . . 24. *A. chrysotaenia* p. 314.

β. Dorsal spines weaker, the third one not or only slightly stronger than the others. No dark longitudinal bands.

1. L.l. 23. Height 2.7—3.2. Eye 2.6—2.8. Chin prominent. Traces of light longitudinal bands. P. 2.11—12 . . . . . 25. *A. cyanosoma* p. 315.

2. L.l. 24—25. Height 2.3—2.6. Eye 2.4—2.8. First dorsal with black patch superiorly between third and fourth spine. A dark spot between sixth and seventh spine. P. 2.10 . . . . . 26. *A. hoeveni* p. 316.

3. L.l. 25—27. Height 2.4—2.8. Eye large 2.1—2.5. A dark streak from eye to angle of praeoperculum. A dark brown band on upper part of caudal peduncle. Sometimes transverse bands on the body. P. 2.11. . . . . 27. *A. bandanensis* p. 317.

4. L.l. 26—27. Height 2.1—2.3. Eye 2.7—3. A broad dark band encircling the caudal peduncle. P. 2.11. . . . . 28. *A. aureus* p. 319.

5. L.l. 26. Height 2.5—2.6. Eye

3—3.2. Traces of transverse bands. Fins dark.

a'. Caudal rounded. . . . . 29. *A. nigripinnis* p. 321.

b'. Caudal incised . . . . . 30. *A. melanopus* p. 322.

6. L.l. 26—27. Height 2.7—2.8. Eye 2.7—3.3. Head and body freckled with minute black spots (melanophores). Upper part of first dorsal blackish. A more or less distinct dark band from snout to eye.

a'. No caninoid teeth. Caudal with rounded lobes . . . . . 31. *A. moluccensis* p. 322.

b'. Caninoid teeth in jaws. Caudal with pointed lobes . . . 32. *A. apogonides* p. 324.

b. Free margin of praeoperculum smooth or with some serrations at angle only. Caudal subtruncate or rounded. Maxillary reaching behind middle of eye (*Apogonichthys*).

a'. Third dorsal spine stronger and longer than the others. L.l. 22—24.

1. Height 2.6—2.7. A dark ocellus on operculum . . . . . 33. *A. auritus* p. 325.

2. Height 2.7—3. A dark ocellus on first dorsal. . . . . 34. *A. ocellatus* p. 327.

3. Height 2.4—2.7. No ocelli. Body and fins freckled with darker spots . . . 35. *A. perdix* p. 328.

b'. Third dorsal spine not stronger than the others, equal to fourth and fifth. L.l. 24—26.

1. Height 3.2. Upper part of first dorsal black. Second dorsal with a marginal and a median black band, anal with a black median band. . . . . 36. *A. ellioti* p. 329.

2. Height 2.4—2.6. Upper part of first dorsal blackish or dusky. No bands on second dorsal.

aa. Scales before first dorsal cycloid. 37. *A. poecilopterus* p. 330.

bb. Scales before first dorsal ctenoid. 38. *A. novaeguineae* p. 332.

c^2. Six dorsal spines. Praeoperculum serrated.

A. Height 1.8—2. Lateral rays of caudal spine-like.

a. No prolonged dorsal rays . . . . . 39. *A. orbicularis* p. 333.

b. First soft rays of second dorsal prolonged into filaments . . . . . 40. *A. nematopterus* p. 335.

B. Height more than 2. No spine-like rays in caudal.

a. Praeopercular ridge, praeorbital and orbital rim serrated. More or less distinct dark transverse bands. . . . . 41. *A. trimaculatus* p. 335.

b. Praeopercular ridge and praeorbital smooth.

1. Maxillary reaching to below hindmargin of eye. Caudal incised. A dark stripe, faintly beginning on operculum, broadening on caudal peduncle and continued on median caudal rays. 42. *A. diencaeus* p. 337.

2. Maxillary almost reaching to below hindmargin of eye. Caudal rounded. Colour uniform brown . . . . . 43. *A. dammermani* p. 338.

3. Maxillary reaching to below hindmargin of eye. Caudal incised. A black spot on caudal peduncle, near base of caudal.

α. A black stripe from operculum to base of caudal. Dorsal profile without marked concavity at nape. Spot on caudal peduncle small.

αα. A black blotch or transverse stripe behind operculum. . . . 44. *A. ceramensis* p. 338.

ββ. No blotch behind operculum. A second black stripe on body, following course of lateral line. 45. *A. amboinensis* p. 340.

β. No stripes. Body uniform. Nape concave. Spot on caudal peduncle large . . . . . 46. *A. hyalosoma* p. 341.

4. Maxillary reaching to below middle of eye. A dark spot on caudal peduncle. Second dorsal spine often filamentous. Caudal incised.

α. Eight soft anal rays. Eye 3—3.5. Mouth somewhat oblique . . . . . 47. *A. sangiensis* p. 343.

β. Nine soft anal rays. Eye 2.4—2.6. Mouth much oblique . . . . . 48. *A. leptacanthus* p. 344.

II. Anal with 13—17 soft rays. Six dorsal spines. Praeoperculum serrated (*Archamia*).

a. Head longer than high. Two longitudinal dark bands on body . . . . . 49. *A. buruensis* p. 345.

b. Head as long as high. No longitudinal bands.

1. A broad dark transverse band from base of second dorsal downwards. . . . . 50. *A. zosterophorus* p. 346.

2. No broad transverse band. Body uniform or with numerous narrow transverse stripes. 51. *A. lineolatus* p. 347.

Doubtful species . . . . . p. 349.

1. Apogon sandei M. Web. [Fig. 75, p. 284].

Apogon Sandei M. Weber, Nova Guinea V. Livr. 2. 1908, p. 247. — Ibid. IX. Livr. 4, 1913, p. 580.

D^1 VI; D^2 I. 10; A. II. 8; P. 2.13; L.l. 46—50; L.tr. $\frac{5}{1}\frac{}{12—15}$.

Dorsal profile somewhat arched with a slight concavity at nape. Height 2.4—2.7, 2.8—3.3 in length with caudal. Head 2.5—2.7, 2.9—3.2 in length with caudal. Eye 3.5—4.1, about equal to snout or longer than snout in smaller specimens and

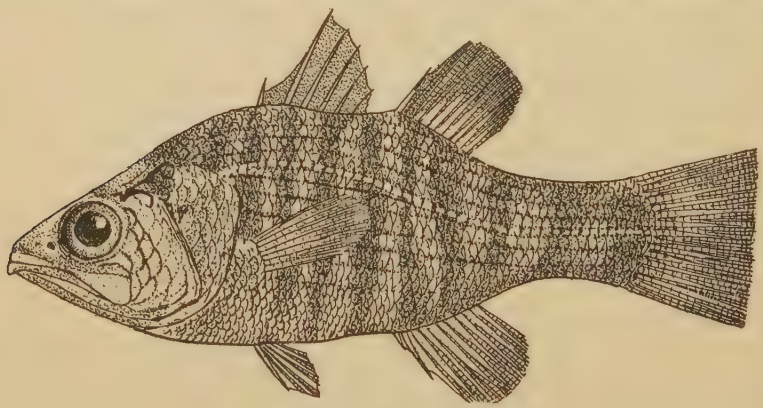

Fig. 75. *Apogon Sandei* M. Web. n. s.

three fifths to seven ninths of interorbital space. Mouth a little oblique, jaws almost equal. Maxillary reaching farther than hindborder of eye. None of the bones of the head serrated. Villiform bands of teeth in jaws, on vomer and palatines. Scales cycloid on head, otherwise ctenoid, but in old specimens the scales are almost smooth. First dorsal spine one fourth to one third of second one, which is longer and much stronger than the others and equal to snout and eye or somewhat shorter. Spine of second dorsal equal to

second anal spine and also to eye. Second dorsal scarcely higher than soft anal, its height equal to snout and eye. Pectorals somewhat longer than ventrals, equal to postorbital part of head or shorter. Caudal very feebly emarginate with rounded lobes. Least height of caudal peduncle 1.2—1.3 in its length, less than snout and eye together. Colour of alcohol specimens yellowish brown, with about eight to ten transverse bands on body and tail, disappearing in large specimens, which are sometimes almost black. Fins more or less dusky. Length over 230 mm. [Type of species in Zoological Museum of Amsterdam seen by us].

Habitat: South New Guinea (Wagami river!, Mimika river, Lorentz river and its tributaries! Upper Digul river!). In freshwater.

2. Apogon gjellerupi n. sp.

Apogon Wichmanni M. Weber, Nova Guinea IX. Livr. 4, 1913, p. 579 (partim).

D^1 VI; D^2 I. 9—10; A. II. 9—10; P. 2.12; V. I.5; L.l. 40—45; L.tr. $\frac{5}{1}$.
$\frac{}{16}$

Dorsal profile arched, that of head with a very feeble concavity. Height 2.5—2.8, 3.2—3.7 in length with caudal. Head 2.3—2.7, 3.2—3.7 in length with caudal. Eye 3.5—4.4, shorter or longer than snout, according to size. Interorbital less than eye. Mouth somewhat oblique. Chin somewhat prominent. Maxillary reaching beyond hindmargin of eye. Conical teeth in about ten rows in jaws, in several rows on vomer and an indistinct double row on palatines. Some blunt teeth on edge and lower border of praeoperculum. Bones of head otherwise smooth. Dorsal spines strong, heteracanth. First dorsal spine much less than half second, which is longer and stronger than the others and almost equal to snout and eye together — in a small specimen longer than snout and eye. Second dorsal higher than first dorsal in large specimens, in small specimens it is less. The longest soft dorsal rays are longer than those of anal and about equal to snout and eye together. Spine of second dorsal somewhat shorter than second anal spine and more than eye. Ventrals equal to postorbital part of head; pectorals half diameter of eye longer. In large specimens ventrals and pectorals are relatively shorter. Caudal feebly emarginate. Scales ctenoid, those of head cycloid. Least height

of caudal peduncle 1.5—1.7 in its length and less than postorbital part of head. Colour of alcohol specimens brownish above, silvery below. An indistinct dark band from hindmargin of eye to upper edge of operculum and another one to lower border of praeoperculum. Body with oblique dark bands as in *A. wichmanni*, those of caudal peduncle sometimes also oblique, in other cases more or less transverse and in many specimens, all from one locality, the oblique band of the inferior part of the body are bent in ventral direction and form longitudinal bands on the caudal peduncle. The bands are sometimes very indistinct, in which case the specimens are almost uniform darkbrown. Fins dusky. Length 177 mm. [Type in the Zoological Museum of Amsterdam].

Habitat: North New Guinea (Kaiserin Augusta river!, Idenburg river!, Mamberamo river!, Otker river!). Named for Dr. K. GJELLERUP.

3. Apogon heurni n. sp.

D^1 VI; D^2 I. 8—9; A. II. 9 (10); P. 2.11—12; L.l. 39—40; L.tr. $\frac{5—6}{1}$ / 16.

Compressed, dorsal profile elevated, that of head somewhat concave. Height 2.4—2.5, 3—3.1 in length with caudal. Head 2.4—2.7, 3—3.4 in length with caudal. Eye 3.2—4.1, about equal to snout and more than interorbital space. Mouth oblique, chin somewhat prominent. Maxillary reaching quite or almost to below hindmargin of eye. Villiform bands of teeth in jaws; teeth on vomer and palatines in several rows. None of the bones of the head serrated. Dorsal spines strong, heteracanth. First dorsal spine minute, one fifth or less of second spine, which is longer than longest rays of soft dorsal and equal to postorbital part of head or longer. Spine of second dorsal scarcely longer than second anal spine and half diameter of eye longer than snout. Ventrals about equal to postorbital part of head, pectorals somewhat longer. Caudal feebly incised, the lobes rounded. Scales ctenoid, those of head cycloid. Least height of caudal peduncle 1.5—1.6 in its length and less than eye and snout. Seven gillrakers, preceded by seven to eight knobs on lower branch of first arch. Colour of formol specimens reddish brown, with indications of oblique black stripes in the upper part of the body, running from the

back downward and forward. Two similar parallel stripes, running one from the upper and the other from the hind-border of eye to occiput. Fins dusky, distal part of ventrals in some specimens blackish. Length 164 mm. [Type in the Zoological Museum of Amsterdam].

Habitat: North New Guinea (Idenburg river!, Otker river, tributary of Mamberamo river!). Named for Jhr. W. C. VAN HEURN.

4. Apogon beauforti M. Web.

Apogon Beauforti M. Weber, Nova Guinea V. Livr. 2, 1908, p. 246. — Abhandl. Senckenb. Naturf. Ges. XXXIV. 1911, p. 27. — Nova Guinea IX. Livr. 4, 1913, p. 580.

D^1 VI; D^2 I. 9; A. II. 9; P. 2.12—13; L.l. 37—41; L.tr. $\frac{5}{1}$ $\frac{}{14—15}$

Dorsal profile arched, that of head concave. Height 2.3—2.5, 2.9—3.1 in length with caudal. Head 2.3—2.5, 2.9—3.1 in length with caudal. Eye 3.6—4.4, equal to snout and five

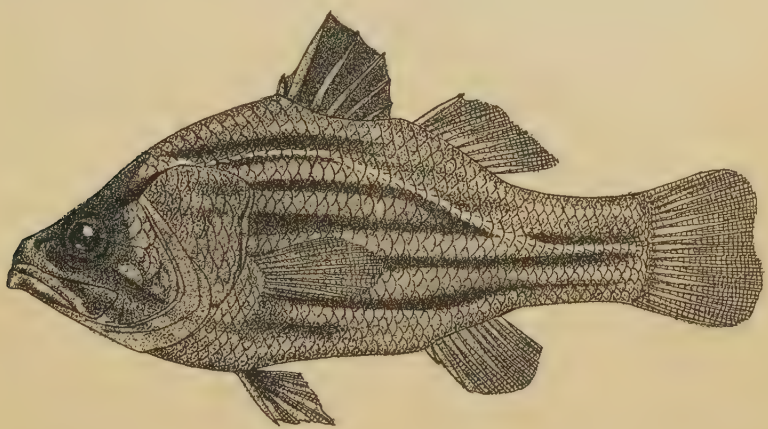

Fig. 76. *Apogon beauforti* M. Web. × 2/3.

sixths or two thirds of interorbital space. Mouth oblique, chin prominent. Maxillary reaching to below hindmargin of eye. Conical teeth in eight to nine rows in upper jaw, in a narrower band in lower jaw, in several rows on vomer and in an indistinct double row on palatines. Praeoperculum, praeopercular ridge and praeorbital smooth. Orbital rim more or less rough. Dorsal spines rather strong, heteracanth. First dorsal spine small, second one longest and much stronger than the others,

curved, almost as long as eye and snout. Spine of second dorsal equal to that of anal, somewhat longer than eye. Height of second dorsal somewhat less than that of anal and equal to snout and eye together and to length of ventrals. Pectorals equal to postorbital part of head or half diameter of eye longer. Caudal very feebly emarginate, with rounded lobes. Least height of caudal peduncle about 1.3 in its length and about equal to postorbital part of head. Scales ctenoid, those of head cycloid. Seven gillrakers, with about 5 short knobs in front, on lower branch of first arch. Colour of alcohol specimens yellowish brown with longitudinal dark bands, varying in number. One of them beginning at superior hindborder of eye, running along lateral line and on upper part of caudal peduncle. One beginning on operculum and continued to middle of caudal peduncle. Two other bands between these beginning behind operculum and one above the first mentioned band. Below the median band a few more, one of which runs from inferior part of base of pectorals to lower part of caudal peduncle. A band from snout to end of maxillary and parallel to this one, an other from middle of eye to preopercular edge. All these bands may be indistinct or disappear altogether, in which case the fish is darkbrown to blackish. Fins dark, especially the ventrals. Length 190 mm. [Type in Zoological Museum of Amsterdam seen by us].

Habitat: New Guinea (Lake Sentani!, pond at Humboldt bay!, Idenburg river!, Mamberamo river!, Lorentz river!); Aru islands!. — In freshwater.

5. **Apogon trifasciatus** M. Web. [Fig. 77, p. 289].

Apogon trifasciatus M. Weber, Nova Guinea IX. Livr. 4, 1913, p. 580.

D^1 VI; D^2 I. 9; A. II. 8 (9)—10; P. 2.14; V. I. 5; L.l. 35—37; L.tr. $\frac{4}{1}$.
$\frac{}{15}$

Dorsal profile arched, head at nape scarcely concave. Height 2.2—2.4, 2.8—3.1 in length with caudal. Head 2.4—2.7, 3.1—3.5 in length with caudal. Eye equal to snout, 3—4. Interorbital space three fourths of eye. Mouth somewhat oblique, chin scarcely prominent. Maxillary not quite reaching to below hindmargin of eye. Small teeth in about six rows in jaws, in three rows on vomer and in a double row on palatines.

Bones of head smooth. Dorsal spines strong, the first about one fourth of the second, which is longer and much stronger than the others, a little longer than longest soft rays of second dorsal, as long as pectorals and one half or one third eye-diameter more than postorbital part of head. Spine of second dorsal longer than second anal spine and longer than eye. Ventrals a little shorter than pectorals. Caudal bluntly rounded.

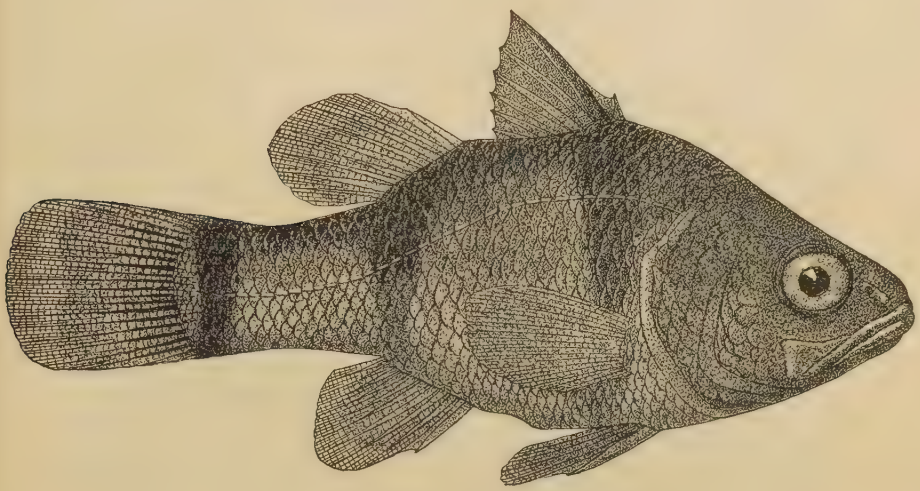

Fig. 77. *Apogon trifasciatus* M. Web.

(This figure is made after a specimen with abnormally 7 dorsal spines).

Scales ctenoid, those on head feebly ctenoid. Least height of caudal peduncle 1.3—1.6 in its length, scarcely less than post-orbital part of head. Colour of alcohol specimens reddish brown with three broad crossbands, the first from origin of first dorsal to ventrals, the second from base of second dorsal to anal, the third at the end of caudal peduncle. Fins dusky or blackish. Some specimens are darker and the bands therefore less distinct. Length 135 mm. [Type in the Zoological Museum of Amsterdam seen by us].

Habitat: South New Guinea (Lorentz river and its tributaries!). In fresh water.

6. Apogon wichmanni M. Web. [Fig. 78, p. 290].

Apogon Wichmanni M. Weber, Nova Guinea V. Livr. 2, 1908, p. 248. — Nova Guinea IX. Livr. 4, 1913, p. 579 (partim).

D^{1} VI; D^{2} I. 9; A. II. 9; P. 2.13; V. I. 5; L.l. 25—33; L.tr. $\frac{5}{1}$. $\frac{}{16}$

Dorsal profile arched, that of head with a feeble concavity. Height 2.4—2.6, 2.8—3.5 in length with caudal. Head 2.3—2.5, 2.8—3.1 in length with caudal. Eye 3.4—5.8, according to size, shorter than snout in large specimens, longer than snout in small ones. Interorbital space more than or equal to eye. Mouth oblique. Chin prominent. Maxillary reaching beyond hindmargin of eye. Conical teeth in eight or more rows in jaws, in several rows on vomer and in an indistinct double row on palatines. Some teeth on edge and lower border of praeoperculum; bones of head otherwise smooth. Dorsal spines strong, heteracanth, at least in larger specimens. First dorsal spine less than half length of second, which is longer and stronger than the others and less than height of second dorsal,

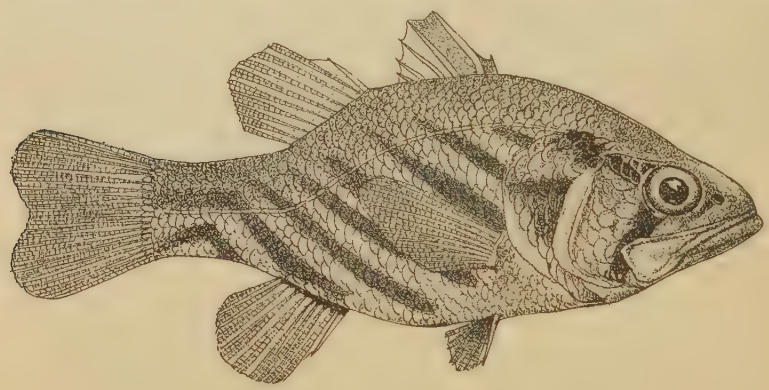

Fig. 78. *Apogon wichmanni* M. Web. × 2/3.

which is somewhat more than height of anal and equal to eye and snout together. In small specimens the spines are relatively longer and more than height of soft dorsal. Spine of second dorsal about equal to that of anal and somewhat more than or equal to eye. Pectorals as long as distance between hindborder of operculum and pupil, ventrals shorter, equal to eye and snout together. Caudal feebly incised, with rounded lobes. Scales ctenoid, those of head cycloid. Least height of caudal peduncle about 1.4—1.5 in its length and less than postorbital part of head. Colour of alcohol specimens brown, lighter and more or less silvery below. A dark band from hindmargin of orbit to upper edge of operculum, an other one to lower border

of praeoperculum. Five or seven oblique dark bands on the sides of the body running from the back, where they begin at some distance of the dorsal profile, downwards and in cranial direction. The two or three last bands are longitudinally bent on the caudal peduncle. Fins dusky, especially the ventrals. The bands on body and tail are sometimes wanting, especially in large specimens, which are often uniform dark brown. Length 220 mm. [Type in Zoological Museum of Amsterdam seen by us].

Habitat: North New Guinea (Sermowai river!, Tawarin river!, Sekanto river!, Mosso river!, Lake Sentani!, Zoutbron!, rivulet near Njao!). In fresh and brackish water.

7. Apogon multitaeniatus (Ehrb.) CV.

Apogon multitaeniatus (Ehrenberg) Cuvier & Valenciennes, Histoire naturelle Poissons II. 1828, p. 159.

Apogon Noordzieki Bleeker, Nat. Tijdschr. Ned. Indië XIX. 1859, p. 336.

Apogon mnltitaeniatus Klunzinger, Abh. zool. bot. Gesellsch. Wien XX. 1870, p. 713 — Fische d. Rothen Meeres 4°, I, 1884, p. 20.

Apogon multitaeniatus Day, Fishes of India 4°, 1875—1878, p. 57.

Amia Noordzieki Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 15 — Atl. ichth. VII. 1873—1876, p. 77.

D^1 VII; D^2 1.9; A. II. 8; P. 2.12; V. I. 5; L.l. 36; L.tr. $\frac{3}{11}$.

Height 2.6, 3.3 in length with caudal. Head 2.7, 3.4 in length with caudal. Eye 3.4. Snout about four fifths of eye, interorbital space scarcely less than eye. Mouth rather oblique, lower jaw slightly included; maxillary reaching to below hinderhalf of eye. Teeth conical, in rather broad bands in jaws and in narrower bands on vomer and palatines. Praeoperculum denticulated, its ridge as well as its praeorbital smooth. Orbital rim rough, but without denticulations. First dorsal spine minute, second more than half of third, which is longest and strongest and almost equal to postorbital part of head. Spine of second dorsal equal to snout and half diameter of eye, second spine of anal shorter, more than eye. Longest soft rays of dorsal longer than those of anal and equal to eye and snout together. Pectorals half diameter of eye longer than postorbital part of head; ventrals somewhat shorter. Caudal feebly incised, the lobes, rounded. Least height of caudal peduncle somewhat less than postorbital part of head, 1.6 in

its length. All the scales ctenoid. About 12 spiculate gillrakers on horizontal branch of first branchial arch, the anterior ones knoblike, the posterior ones long and slender. Colour of alcohol specimen reddish brown with traces of longitudinal narrow dark bands, according to the rows of scales. Upper border of first dorsal blackish, the other fins hyaline. Length 115 mm. [Description made after the type of *A. noordzieki* in the Leiden Museum].

Habitat: Java (Patjitan!). — Red Sea, coast of British India, Philippines. In sea.

8. Apogon kalosoma Blkr.

Apogon kalosoma Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 448.
Lepidamia kalosoma Gill, Proc. Acad. Nat. Science Philadelphia 1863, p. 81.
Amia kallosoma Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 16. — Atl. ichth. VII. 1873—1876, p. 78.
Apogon calosoma Day, Fishes of India 4°, 1875—1878, p. 57.

D^1 VII; D^2 I.9; A. II.8; P. 2.12—13; V. I.5; L.l. 35—36; L.tr. $\frac{3}{1}$.
$\frac{}{10}$

Height 3.2—3.3, 3.8—4.2 in length with caudal. Head 2.6—2.8, 3.3—3.5 in length with caudal. Eye about 3, three fourths of their diameter apart. Snout about four fifths of eye. Praeoperculum denticulated, its ridge smooth as well as praeorbital. Mouth rather oblique, reaching to below hinderhalf of eye, lower jaw slightly included. Teeth in bands in jaws and on vomer and palatines. First dorsal spine minute, second one more than half of third, which is longest and strongest and equal to snout and eye together. Spine of second dorsal longer than second spine of anal and equal to postorbital part of head. Pectorals half diameter of eye longer than postorbital part of head; ventrals somewhat shorter. Caudal feebly incised, the lobes rounded. Colour of alcohol specimens reddish brown, with a dark lateral band from head to base of caudal, where it ends in a large caudal spot, which however may be absent. A second band from upper part of opercle, along sides at some distance below profile of back. Upper part of first dorsal blackish. About 12 spiculate gillrakers on horizontal branch of first branchial arch; the anterior ones knob-like, the posterior ones long and slender. Length 69 mm. [Description

made after the three typical specimens of BLEEKER in the Leiden Museum].

Habitat: Banka!; Biliton; Lepar!. — Madras. In sea.

Note. This species is perhaps only a colour variety of *A. multitaeniatus*.

9. Apogon godini Blkr.

Apogon Godini Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 496.
Amia Godini Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II, n° 1 (1873) 1874, Révision Apogon. p. 17. — Atl. ichth. VII. 1873—1876, p. 78.

D^1 VII; D^2 I.9; A. II.8; P. 2.12; V. I.5; L.l. 33?; L.tr. $\frac{3}{1}$.
$\frac{?}{?}$

Height 2.9, 3.7 in length with caudal. Head 2.8, 3.5 in length with caudal. Eye 3.4, somewhat more than four fifths of their diameter apart. Snout about four fifths of eye. Praeoperculum denticulated, its ridge smooth as well as praeorbital. Mouth rather oblique, maxillary reaching to below hinderhalf of eye. Teeth in rather broad bands in jaws and on vomer and palatines. Third dorsal spine longer and stronger than the others, longer than postorbital part of head. Pectorals about half eyediameter longer than postorbital part of head. Ventrals somewhat shorter. Caudal incised. Colour of alcohol specimen uniform reddish brown. Length 95 mm. [Description made after the type specimen in the Leiden Museum, seen by us].

Habitat: Sumatra (Priaman!). In sea.

Note. Besides the type no other specimens of this species are known. The type is in rather bad condition, most of the scales are wanting. Possibly this species is nothing but a colour variety of *A. multitaeniatus*.

10. Apogon tubulatus M. Web.

Apogon tubulatus M. Weber, Notes Leyden Museum XXXI. 1909, p. 160 — Siboga Exp. Fische 1913, p. 234.

D^1 VII; D^2 I,9; A. II.8; P. 12; L.l. about 24; L.tr. $\frac{1}{1}$.
$\frac{}{5}$

Oblong. Height about equal to head, 2.6, 3.4 in length with caudal. Profile from dorsal to snout sloping down almost in a straight line; the snout convex. Eye 3. Snout three fourths of eye. Lower jaw slightly prominent. Maxillary does not

reach to below hindborder of eye. First dorsal spine minute, second one half as long as third, which is the longest. The second dorsal is only a little higher than the first one and less than half height of body. Caudal deeply incised with pointed lobes. Praeoperculum feebly denticulated. Scales ctenoid, four or five keeled ones in front of first dorsal. Jaws, vomer and palatines with fine equal teeth. Anterior part of tongue with black pigment spots. Least height of caudal peduncle about 1.2 in its length. Nine gillrakers, the longest much shorter than diameter of eye. Colour of alcohol specimens yellowish, with indications of a darker marmoration or of bands. Belly and sides of head silvery. Above the anus at both sides a silvery subcutaneous tube runs to the end of the tail [1]). Length 35 mm. [Type in the Zoological Museum of Amsterdam seen by us].

Habitat: Strait Sapeh, near Sumbawa, 70 M.! Near West coast of New Guinea, 32 M!. Saleyer 10—20 M.! In sea.

11. Apogon argyrogaster M. Web.

Apogon argyrogaster M. Weber, Notes Leyden Museum XXXI. 1909, p. 159 — Siboga Exp. Fische 1913, p. 233.

D^1 VII; D^2 I.9; A. II.9; P. 15; L.l. ca. 22—23; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{6}$

Dorsal profile at first dorsal convex, from here to snout very feebly convex, almost straight. Height 2.6, 3.3 in length with caudal. Head 2.3, 2.8 in length with caudal. Eye about 3. Interorbital space about five ninths of eye, snout about two thirds of eye. Jaws equal. Mouth oblique. Maxillary reaching to below hindborder of eye or not quite so far. Praeoperculum denticulated. Praeopercular ridge, praeorbital and orbital rim without denticulations. Teeth conical in about five rows in jaws, in several rows on vomer. A few only at proximal end of palatines. First dorsal spine minute. The fourth spine is the longest and is two thirds of height of second dorsal. The fifth and third spine are only slightly shorter, the second is scarcely half as long as the third one. Height of anal equal to that of second dorsal and more than half height of body. Pectorals equal to ventrals, as long as distance between hindborder of operculum

1) For particulars see M. Weber, Siboga Exp. Fische 1913, p. 244.

to middle of pupil. Caudal truncate. Scales ctenoid. Least height of caudal peduncle 1.3 in its length. Colour of alcohol specimens brown above, with irregular darker spots. Belly silvery, the silvery peritoneum shining through. As the peritoneum forms two subcutaneous diverticula above base of anal [1]), the silvery colour is continued above anal and sharply defined against the brown of the sides. Fins dusky, especially the first dorsal, base of second dorsal and outer half of ventrals. Length 60 mm. [Type in Zoological Museum of Amsterdam seen by us].

Habitat: Near West coast of New Guinea 32 M.! In sea.

Note. The type specimen has eggs in the mouth.

12. Apogon frenatus Val.

Apogon frenatus Valenciennes, Nouv. Ann. Mus. Hist. Nat. 1832, p. 57.
Apogon vittiger Bennett, Proc. Zool. Soc. London 1833, p. 32.
Apogon vittiger Telfair, Isis 1835, p. 522.
Apogon kallopterus Bleeker, Act. Soc. Scient. Indo Neerl. I. Beschr. vischsoorten Menado 1856, p. 33.
Apogon frenatus Bleeker, l.c. Beschr. vischsoorten Amboina, p. 25.
Apogon frenatus Günther, Cat. Brit. Mus. I. 1859, p. 241.
Amia vittigera Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 358 (name only).
Apogon frenatus Klunzinger, Abh. zool. bot. Ges. Wien XX. 1870, p. 715.
Apogon frenatus Günther, Fische der Südsee I. 1873—1875, p. 19.
Amia kallopterus Bleeker, Atl. ichth. VII. 1873—1876, p. 89.
Amia frenata Bleeker, ibid.
Apogon frenatus Day, Fishes of India 4°, 1875—1878, p. 58.
Apogon (Pristiapogon) frenatus Klunzinger, Fische des rothen Meeres I. 1884, p. 22.
Apogon snyderi Jordan & Evermann, Bull. U. S. Fish. Comm. XXII. (1902) 1904, p. 180.
Amia snyderi Jordan & Evermann, ibid. XXIII. (1903) 1905, p. 214.
Amia fraenata Evermann & Seale, Bull. Bureau Fish. XXVI. 1906, p. 71.
Amia frenata Steindachner, Fischfauna Samoa-Inseln, Sitzber. Akad. Wien CXV. Abt. I. 1906, p. 1379.
Amia snyderi Jordan & Evermann in Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 237.
Amia exostigma Jordan & Starks in Jordan and Seale, l. c. p. 238.
Amia kalloptera Jordan & Richardson, ibid. XXVII. (1907) 1908, p. 255.
Apogon vittiger Tate Regan, Trans. Linn. Soc. London XII. (3), 1908, p. 225.
Apogon frenatus Kendall & Goldsborough, Mem. Mus. Comp. Zoology Harvard Coll. XXVI. n° 7, 1911, p. 276.
Apogon exostigma Kendall & Goldsborough, l. c. p. 278.

1) For particulars see M. Weber, Siboga Exp. Fische 1913, p. 244.

Amia exostigma Kendall & Radcliffe, ibid. XXXV. n° 3, 1912, p. 101.
Apogon frenatus M. Weber, Siboga Exp. Fische 1913, p. 227.
Amia bifasciata Fowler & Bean, Proc. U.S. Nat. Mus. Washington vol. 62, 1922, Art. 2, p. 24 (nec RÜPPELL).

D^1 VII; D^2 I.8—9; A. II.8; P. 2.10—12; V. I.5; L.l. 25—26; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{7}$

Rather elongate, dorsal profile sloping gently from dorsal to snout. Height 2.9—3.3, 3.6—4.2 in length with caudal. Head 2.4—2.7, 3.1—3.4 in length with caudal. Eye 2.5—3, about two thirds eyediameter apart and a little more than snout. Mouth somewhat oblique, maxillary reaching almost to below middle of eye. Two vertical rows of large scales on praeoperculum, which is denticulated along its hind- and lower border. Praeopercular ridge denticulated. Lower orbital rim with strong denticulations. Praeorbital smooth. Conical teeth in several rows in the jaws, a single or incomplete double row on vomer and on anterior part of palatines. First dorsal spine minute, second one about half as long as third one, which is stronger than the other spines but not much longer than the fourth one and scarcely less than snout and eye. Spine of second dorsal equal to fifth of first dorsal and also to eye. Second anal spine shorter, about equal to snout. Longest soft rays of anal shorter than those of dorsal, which are equal to eye and snout. Origin of anal below middle of second dorsal. Pectorals a little longer than eye and snout together, ventrals a little shorter. Caudal forked, the lobes rather pointed. Least height of caudal peduncle about 1.5 in its length and equal to postorbital part of head. Colour of alcohol specimens yellowish brown, lighter and somewhat silvery below. A dark brown lateral band from snout to caudal. Base of caudal with a dark spot or patch, either median or above the lateral line. The median band may be bordered by white or silvery above and below, generally more distinct on operculum and sometimes also on snout. A dark patch at base of second dorsal sometimes present. Membrane between anterior spines of first dorsal dark brown. Dorsal and anal often with a black longitudinal stripe at some distance of the base of the fins. Upper and lower border of caudal and membrane between first soft rays of ventral dark. Pectorals hyaline. Length 140 mm.

Habitat: Pulu Weh!; Singapore; Java; Bawean; Celebes (Menado, Badjoa); Biaru!; Sangir islands; Talaut islands!; Buru; Ceram!; Ambon!; Goram; Batjan; Ternate; New Guinea (Tarfia!, Tana merah bay!, Humboldt bay!). — From Mauritius and East coast of Africa to Red sea, coasts of British India, Philippines and eastwards to the Hawaiian islands and Paumotu islands.

In sea and brackish water, entering sometimes freshwater.

13. Apogon brevicaudatus M. Web.

Apogon brevicaudatus M. Weber, Notes Leyden Museum XXXI. 1909, p. 158 — Siboga Exp. Fische 1913, p. 232.

Amia berthae Ogilby, Ann. Queensland Mus. X. 1911, p. 47 — Mem. Queensland Mus. I. 1912, p. 50.

Apogon brevicaudatus McCulloch, Mem. Queensl. Museum VII. Prt. III. 1921, p. 168.

D^1 VII; D^2 I. 9 (10); A. II. 8 (9); P. 2.13; V. I. 5; L.l. 23; L.tr. $\frac{1\frac{1}{2}}{6}$.

Dorsal profile from snout to dorsal convex. Height 2.3—2.4, 3 in length with caudal. Head 2.5, 3.2 in length with caudal. Eye 2.8—3.3, according to size. Snout about equal to interorbital space and about four fifths of eye. Mouth oblique,

Fig. 79. *Apogon brevicaudatus* M. Web. about × 3/4.

jaws equal. Maxillary reaching to below hindborder of pupil, its height posteriorly about 1.8 in eye. Praeoperculum strongly serrated. Praeopercular ridge with smaller serrations, some

larger ones at the edge. Praeorbital large, smooth. Orbital rim with irregular serrations. Nape with distinct longitudinal skinfolds. Dorsal spines strong, first minute, second less than half third, which is equal to fourth and scarcely less than postorbital part of head. Spine of second dorsal somewhat shorter than third spine of first dorsal, longer than second anal spine, which is scarcely more than eye. Longest rays of soft dorsal almost equal to head without snout, those of anal shorter, equal to snout and eye together. Ventrals longer than pectorals, almost equal to head without snout. Pectorals equal to distant from hindborder of operculum to hindborder of pupil. Caudal very feebly emarginate with rounded lobes. Least height of caudal peduncle somewhat more than its length and equal to postorbital part of head. Teeth conical, on about four or five rows in jaws, those on vomer and palatines in an indistinct double row. Colour of alcohol specimens yellowish brown, silvery below. From the hindborder of the orbits three distinct darker brown bands diverge to praeoperculum. Seven to eight darkbrown longitudinal bands from head to caudal. Two curved ones above the lateral line, the third, which is also curved, runs directly below the lateral line and unites below end of second dorsal with the fourth band, which runs straight to caudal. The seventh does not reach caudal peduncle, but runs to end of base of anal. Fins light brown, second dorsal and anal with a basal black ocellus, broadly bordered by white. In young specimens there are besides the longitudinal bands three indistinct broad crossbars, one below first dorsal, the second from second dorsal to anal and the third on caudal peduncle. Length 135 mm. [Type in Zoological Museum of Amsterdam seen by us].

Habitat: Jedan islands, near Aru islands! — Queensland (Dunk island, Capricorn group, Wide Bay). In sea.

14. Apogon taeniopterus Benn.

Apogon taeniopterus Bennett, Proc. Zool. Soc. London III. 1835, p. 206.
Apogon taeniopterus Günther, Cat. Brit. Mus. I. 1859, p. 235.
Amia taeniopterus Bleeker, Verh. Akad. Amsterdam XVIII. (1877) 1879, Contrib. à la faune ichth. Maurice, p. 11 (nec *Amia taeniopterus* Bleeker, Atl. ichth. VII. 1873—1876, p. 99. = *ellioti* Day).
Apogon taeniopterus Macleay, Proc. Linn. Soc. N. S. Wales VII. 1882, p. 236.

D^1 VII; D^2 1.8—10 (?); A. II. 8; L.l.? L.tr.?

Limbs and inner edge of praeoperculum denticulated. Caudal notched. First dorsal with oblique black spots between the spines; second dorsal and anal with a black band along the base; each lobe of the caudal with a blackish streak; the outer margin of the ventral blackish. Body without longitudinal or transverse bands. Length? ("Large specimen"). [After GÜNTHER, not seen by us].

Habitat: New Guinea. — Zanzibar, Isle de France.

15. Apogon margaritophorus Blkr.

Apogon margaritophorus Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 363.
Amia margaritophora Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 46 — Atl. ichth. VII. 1873—1876, p. 91.
? *Amia margaritophora* Evermann & Seale, Bull. Bureau fish. XXVI. 1906, p. 74.

D^1 VII; D^2 I. 9 (10); A. II. 8 (9); P. 2.10—11; V. I. 5; L.l. 26—27; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{6}$

Height 2.5—2.8, 3.1—3.5 in length with caudal. Head 2.4—2.8, 3—3.3 in length with caudal. Eyes 2.6—3.1, about eight ninth of eyediameter apart and more than length of snout. Mouth oblique, maxillary reaching to below middle of eye. Two or three vertical rows of scales on praeoperculum, which is denticulated along its hind- and lower border. Praeopercular ridge and suborbitals with a rough border, but without serrations. Praeorbital smooth. Small teeth, forming rather narrow bands of about 4 or 5 rows in jaws, in a few rows on vomer and on palatines. First dorsal spine minute, often scarcely distinguishable, second small, one fourth of third spine, which is stronger than the others, but not much longer than the fourth and equal to snout and eye or somewhat longer. Spine of second dorsal equal to fifth spine of first dorsal and to second anal spine, not much shorter than postorbital part of head. Longest soft rays of anal somewhat shorter than those of dorsal, which are equal to eye and snout. Origin of anal below anterior half of second dorsal. Pectorals and ventrals subequal, as long as snout and eye. Caudal incised, the lobes more or less pointed. Least height of caudal peduncle 1.5 in its length and about equal to postorbital part of head. Colour of preserved specimens yellowish,

lighter and somewhat silvery below. A blackish band from snout to eye, faintly continued behind eye on head and body, a second one from chin and lower jaw running on maxillary below eye and continued on operculum and on body; these two dark bands separated by a silvery band, which is most distinct on the head and broken into a row of round pearly spots on the body. An other silvery band above the first darkish band, continued on operculum and faintly on body, where it broadens. Above this silvery band again a faint darkish band, running from upper part of operculum to caudal peduncle. Anterior part of dorsal and ventrals dusky, other fins hyaline. Length 70 mm. [Types of BLEEKER in the Leiden Museum examined by us].

Habitat: Pulu brani; Singapore!; Java sea!; Bawean!; Celebes (Makassar!); Biaru!; Batjan!. — Philippines?. In sea.

Note. BLEEKER mentions only six spines in the first dorsal, but in the typical specimens as well as in other specimens examined by us, there are seven, the first being very small and often hardly visible. Besides by its coloration this species is easily distinguished from the related *A. chrysotaenia* by the short second dorsal spine.

16. Apogon quadrifasciatus C V.

? *Mullus fasciatus* Shaw, in White, Voy. N. S. Wales 1790, p. 268.
Apogon quadrifasciatus Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 153.
Apogon quadrifasciatus Bleeker, Verh. Bat. Gen. XXII. Percoïd. 1849, p. 28.
Apogon quadrifasciatus Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 985.
Apogon quadrifasciatus Günther, Cat. Brit. Mus. I. 1859, p. 239.
Apogon quadrifasciatus Kner, Novara Exp. Fische 1865—1867, p. 43.
Apogon quadrifasciatus Steindachner, Fische Singapore, Sitzb. Akad. Wien LX. I. 1870, p. 559.
Amia quadrifasciata Bleeker, Verh. Holl. Maatsch. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 39 — Atl. ichth. VII. 1873—1876, p. 88.
Apogon quadrifasciatus Day, Fishes India 4° 1875—1878, p. 59.
Apogon monogramma Günther, Challenger Exp. Zool. Shore-Fishes 1880, p. 38.
Apogon quadrifasciatus Macleay, Descr. Cat. Austr. Fish. I. 1881, p. 44.
? *Apogon evanidus* Fowler, Journ. Acad. Nat. Sci. Philadelphia (2) XII. Prt. 4, 1904, p. 518.
Apogon quadrifasciatus Tate Regan, Journ. Bomb. Nat. Hist. Soc. XVI. 1905, p. 330.
Amia quadrifasciata Jordan & Seale, Bull. Bureau Fisheries XXVI (1906) 1907, p. 16.
Amia quadrifasciata Jordan & Richardson, Catal. Fishes Formosa, 1909, p. 181.
Amia quadrifasciata Seale, Philippine Journ. Science V. n° 4, 1910, p. 274.
Amia quadrifasciata Bean & Weed, Proc. U. S. Nat. Mus. vol. 42, 1912, p. 604.

Apogon quadrifasciatus M. Weber, Siboga Exp. Fische 1913, p. 226.
Amia quadrifasciata McCulloch, Biol. Results „Endeavour" vol. III. 1915, p. 120 (nec synon.).
Apogon quadrifasciatus McCulloch, Check-list fish of N.S. Wales, Part II. 1919, p. 49.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.13—14; V. I. 5; L.l. 25—27; L.tr. $\frac{1\frac{1}{2}}{1} / 6\frac{1}{2}—7$.

Upper profile somewhat arched. Height 2.5—2.9, 3.1—3.6 in length with caudal. Head 2.4—2.9, 3.1—3.5 in length with caudal. Eye 2.8—3.5, about three quarters of eyediameter apart and shorter than snout. Mouth oblique, reaching to below posterior half of eye. Two rows of scales on praeoperculum, which is serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth. Orbital rim very rough and provided inferiorly with more or less distinct serrations. Conical teeth in bands of about 4 rows in jaws, in an indistinct double row on vomer and in a single row on palatines. First dorsal minute, in small specimens scarcely projecting beyond the skin, but always visible; second one a little less than half of third one, which is scarcely longer than fourth, somewhat stronger than the others and equal to postorbital part of head. Spine of second dorsal equal to fifth spine of first dorsal and somewhat more than eye. Second anal spine equal to eye. Longest soft rays of dorsal somewhat more than postorbital part of head and shorter than longest soft anal rays, which are about equal to snout and eye. Pectorals somewhat longer than ventrals and slightly less than head without snout. Caudal feebly incised, the lobes rounded. Least height of caudal peduncle about 1.7 in its length, about equal to postorbital part of head. Colour of preserved specimens yellowish brown, lighter and often somewhat silvery below. Two dark longitudinal bands: one running from snout through eye to end of middle caudal rays; the other from tip of snout, above eye, along upper part of back to upper caudal rays, often indistinct in its posterior part. Both bands bordered by a silvery stripe above and below, especially in small specimens and often only partially developed or indistinct. Anus generally in a black spot. Anterior part of first dorsal, posterior part of second dorsal and anal and tip of ventrals dusky. Pectorals and caudal excepting the median dark band, hyaline. Length

112 mm. [Specimens of BLEEKER's collection in the Zoological Museum of Amsterdam seen by us].

Nom. indig. Glaga (Malay Batavia).

Habitat: Singapore; Sumatra (Padang); Banka; Borneo (Sandakan); Java-sea!; Java (Batavia!, Bantam, Japara); Celebes (Makassar, Bonthain, Badjoa, Menado!); Saleyer!; Timor!; Arafura-sea. — From coast of Mossambique, Persian Gulf, British India to Philippines, Formosa, China and Japan(?), coasts of Queensland and New South Wales, eastwards to Feedjee islands. — In sea, on reefs and in depths up to 88 M.

Note. MCCULLOCH l. c. says that the first dorsal spine is wanting in the young, it being first developed in specimens about 60 mm. long. We find it however in much smaller specimens. This is the reason why we do not include, as MCCULLOCH does, *Apogon kiensis* Jord. & Snyder from Japan in the synonymy of *quadrifasciatus*, as *A. kiensis* has 6 dorsal spines. *A. quadrifasciatus* has been recorded from Japan by JORDAN & SNYDER (Proc. U. S. Nat. Mus. XXIII. 1900, p. 353), but this is an error for *A. semilineatus* (see JORDAN & SNYDER, l. c. p. 903). The occurrence of *A. quadrifasciatus* in Japan is therefore only based on a record of BLEEKER (Verh. Akad. Amsterdam XVIII (1877) 1878, Poissons Japon. p. 6).

17. Apogon novemfasciatus C V.

Apogon fasciatus Quoy & Gaimard, Voyage de l'Uranie et de la Physicienne, 1824, p. 344 (nec SHAW).

Apogon novemfasciatus Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 154.

Apogon balinensis Bleeker, Verh. Bat. Gen. XXII. 1849, Bijdr. ichthyol. fauna Bali, p. 5.

Apogon novemfasciatus Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 163.

Apogon aroubiensis Hombron & Jacquinot, Voyage au Pole Sud, Poissons 1853, p. 31.

Apogon fasciatus Günther, Cat. Brit. Mus. I. 1859, p. 241 (nec SHAW).

Apogon fasciatus Kner, Novara-Exp. Fische, 1865—1867, p. 43.

Apogon fasciatus Klunzinger, Abhandl. zool. bot. Ges. Wien XX. 1870, p. 712.

Apogon fasciatus Günther, Fische d. Südsee I. 1873—1875, p. 19, partim Taf. 20, Fig. B.

Amia fasciata Bleeker, Verh. Holl. Maatsch. v. Wetensch. Haarlem 3de Verz. n° 1 (1873) 1874, Révision Apogon. p. 36 — Atl. ichth. VII. 1873—1876 p. 87 (nec SHAW).

Apogon endekataenia Day, Fishes of India 4°, 1875—1878, p. 59 (nec BLEEKER).

Apogon fasciatus Klunzinger, Sitzber. Akad. Wien 1880, p. 344.

Apogon fasciatus Klunzinger, Fische des rothen Meeres I. 1884, p. 20 (nec SHAW).

Apogon fasciatus Day, Fishes of India 8° vol. I, 1889, p. 494 (nec SHAW).

Apogon fasciatus Perugia, Ann. Mus. Civ. Genova (2) VII. 1889, p. 272 (nec SHAW).
Apogon fasciatus Pfeffer, Jahrb. d. Hamb. wissenschaftl. Anstalt X. 1893, p. 6 (nec SHAW).
Apogon fasciatus Boulenger, Ann. Mag. Nat. Hist. (6) XX. 1897, p. 372 (nec SHAW).
Apogon fasciatus Jatzow & Lenz, Abh. Senckenb. Ges. XXI. 1899, p. 500 (nec SHAW).
Apogon fasciatus Seale, Occ. Papers Bern. Pauahi Bish. Mus. Honolulu I. 1901, p. 75 (nec SHAW).
Amia aroubiensis Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 241.
Amia novemfasciatus Jordan & Seale, ibid. p. 242 (partim).
? *Amia fasciata* Evermann & Seale, ibid. XXVI. (1906) 1907, p. 72.
? *Amia compressa* Radcliffe, Proc. U.S. Nat. Mus. XLI. 1911, p. 246.
Amia aroubiensis Radcliffe, l.c. p. 250.
Amia novemfasciata Radcliffe, l.c. p. 251.
? *Amia angustata* Radcliffe, l.c. p. 253.
Amia novemfasciata Snyder, ibid. XLII. 1912, p. 497.
Apogon novemfasciatus M. Weber, Siboga Exp. Fische 1913, p. 224 (partim).
Amia fasciata novemfasciata Mc. Culloch, Biol. Results „Endeavour" III. 1915, p. 117.
Amia fasciata aroubiensis McCulloch, l.c. p. 118.
? *Amia fasciata compressa* McCulloch ibidem.
Amia novemfasciata Jordan & Starks, Ann. Carnegie Mus. vol. XI. nos. 3—4, 1917, p. 448.

D^1 VII; D^2 I. 9; A. II. 8; P. 2. 11—12; V. I. 5; L.l. 26—27; L.tr. $\frac{1\frac{1}{2}}{6\frac{1}{2}—7}$.

Height 2.7—2.9, 3.3—3.6 in length with caudal. Head 2.4—2.8, 2.9—3.5 in length with caudal. Eye 2.8—3, snout three fourths of eye, interorbital space two thirds of eye. Mouth oblique, maxillary reaching to below posterior half of eye. Two indistinct vertical rows of scales on praeoperculum, which is finely serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth, orbital rim somewhat rough, but without serrations. Height of praeorbital one third of eye or still narrower. First dorsal spine minute, second one less than half length of third, which is the longest and strongest and equal to snout and eye. Spine of second dorsal somewhat shorter than or — in small specimens — equal to fourth spine of first dorsal, about equal to postorbital part of head. Second anal spine equal to eye. Longest rays of soft dorsal equal to head without snout, those of anal equal to postorbital part of head. Pectorals a little longer than ventrals, somewhat shorter than head without snout. Least height of caudal peduncle about 1.5 in its length, equal to postorbital part of head. Caudal incised, the lobes rounded. Colour of

alcohol specimens light reddish brown, with three distinct longitudinal dark brown principal bands, about equal to the interspaces on the body but broader than the interspaces on head. The upper one running from snout, where it converges with that of the other side, along upper part of back to base of caudal, where it is deflected somewhat towards the median line, continued on upper rays of caudal, but not always very distinct. The second one running from snout through eye to caudal, where it is continued on median caudal rays. It is often broader and darker below first and second dorsal, forming there more or less distinct very dark patches. The third one running from lower part of snout, through posterior part of eye and axil of pectoral, where it often forms a black spot, to lower part of caudal, where it is somewhat turned upwards and continued on lower rays of caudal. Besides these three distinct bands a generally less distinct one, beginning as a single median one between eyes, split into two at base of dorsal, and continued to end of second dorsal. An other indistinct band between the first and second principal ones, from eye to below first dorsal or not so far may be present. Below the third principal band a less distinct one running from end of maxillary to middle of base of anal. The interspace between these bands is sometimes more or less silvery, on the head and body, especially on operculum between second and third principal band, where it forms a silvery opercular patch or stripe. Upper part of first dorsal and tip of ventrals dusky. Second dorsal and anal with a dark basal band. [Specimens of BLEEKER's collection in the Museum of Amsterdam seen by us].

Habitat: Pulu Weh!; Sumatra (Kauer, Benkulen, Trussan, Ulakan, Padang, Priaman, Siboga); Nias!; Pulu Nako!; Batu; Lepar; Java (Patjitan, Karangbollong, Prigi); Bawean; Bali; Celebes (Makassar, Menado!, Tombariri, Gorontalo); Sulu islands!; Biaru!; Sangir islands; Talaut islands!; Saleyer!; Flores!; Haingsisi!; Savu!; Roma!; Solor!; Timor!; Kei-islands!; Aru islands; Tiur!; Goram; Nusa laut!; Ambon!; Banda; Ceram!; Buru!; Ternate; Waigeu!; New Guinea (Doreh). — From east coast of Africa and the Red Sea, British India, Philippines, Honkong, North coast of Australia, southern Pacific islands eastwards to the Society islands.

Note. This is a very variable species, and according to the value attached by different authors to the colour pattern it has been treated as a single species, as many species (RADCLIFFE) or as subspecies (MC CULLOCH). The broadness of the bands varies very much and the interspaces between them, especially on the head, can become so narrow that they appear as silvery stripes. In such cases the colour of the head is exactly as that of *A. chrysotaenia*, but the slightly longer maxillary can help to identify it.

We have only studied material from the Indo-australian Archipelago and we think we can recognise here two species, not differing in the colour pattern but in the shape of the head. One species (*A. novemfasciatus*), which is the commoner, has a rather pointed snout and a low praeorbital, the other one (*A. endekataenia*) has a blunt snout and a higher praeorbital. A good idea of these differences can be got from GÜNTHER's figures A and B of *Apogon fasciatus* on plate 20 of „Fische der Südsee I". There is no difference in the colours, although we never find a caudal spot in what we consider to be *A. novemfasciatus*, whereas such a spot is generally — but not always — present in *A. endekataenia*.

We have included *Amia compressa* Radcliffe, although with a query, in the synonymy of *A. novemfasciatus*. According to RADCLIFFE it has only 6 dorsal spines and is further characterized by „a short bar from upper part of eye, backward, thence upward, merging into first stripe and ending on tenth scale of lateral line."

MC CULLOCH l. c. considers it to be a colour variety of *Amia fasciata* (*Apogon novemfasciatus*) and characterizes it as follows: „A distinct secondary band anteriorly between the median and dorso-lateral ones, which curves upwards and joins the latter; some irregular spots at the caudal base."

MC CULLOCH does not mention the number of dorsal spines, but we can hardly believe that he would have considered it as a subspecies of *A. novemfasciatus* if it had only 6 dorsal spines.

It is curious that RADCLIFFE examined specimens from Borneo and the Moluccas and that MC CULLOCH also mentions specimens from the Malay Archipelago, whilst we do not find in our extensive material a single specimen which agrees completely with the descriptions of these authors.

18. Apogon endekataenia Blkr.

Apogon endekataenia Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 449.
Apogon fasciatus Steindachner, Sitzber. Akad. Wien LIII. I. 1866. p. 427.
Apogon fasciatus Günther, Fische d. Südsee I. 1873—1875, p. 19, Tafel 20, Fig. A.
Amia endekataenia Bleeker, Verh. Holl. Maatsch v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 31. — Atl. ichth. VII. 1873—1876, p. 85.
? *Apogon fasciatus* de Castelnau, Proc. Linn. Soc. N.S. Wales III. 1879, p. 370.
? *Apogon fasciatus* Macleay, Descr. Cat. Austral. Fish I. 1881, p. 43.
Apogon Cookii Macleay, l.c. p. 44.
Amia endekataenia Evermann & Seale, Bull. Bureau Fisheries XXVI. 1906 (1907), p. 73.
Apogon endekataenia Ogilby, Proc. Roy. Soc. Queensland XXI. 1908, p. 23.
Amia fasciata Radcliffe, Proc. U. S. Nat. Mus. XLI. 1911, p. 249 (nec Shaw).
Amia robusta Radcliffe, l.c. p. 255.
Apogon novemfasciatus M. Weber, Siboga Exp. Fische 1913, p. 224 (partim).
Amia fasciata fasciata Mc Culloch, Biol. Results Endaevour, III. 1915, p. 115 (partim?).
Amia fasciata stevensi Mc Culloch l.c. p. 118.
? *Amia endekataenia* Jordan & Starks, Ann. Carnegie Mus. vol. XI. 1917, p. 448.

D^1 VII; D^2 I. 9 (10); A. II. 8; P. 2.12; V. I. 5; L.l. 26; L.tr. $\frac{1\frac{1}{2}}{1}\cdot\frac{}{6\frac{1}{2}}$.

Height 2.8, 3.5 in length with caudal. Head 2.6, 3.2—3.3 in length with caudal. Eye 3. Snout two thirds of eye and equal to interorbital space. Mouth oblique, maxillary reaching to below posterior half of eye. Two indistinct vertical rows of scales on praeoperculum, which is finely serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth, orbital rim somewhat rough, but without serrations. Height of praeorbital about one half of eye. First dorsal spine small, second one more than half length of third, which is the longest and strongest and equal to snout and eye. Spine of second dorsal somewhat shorter than fourth spine of first dorsal, about equal to postorbital part of head. Second anal spine equal to eye. Longest rays of soft dorsal about equal to head without snout, those of anal equal to postorbital part of head. Pectorals as long as or a little longer than ventrals, somewhat shorter than head without snout. Least height of caudal peduncle about 1.5 in its length, equal to postorbital part of head. Caudal incised, the lobes rounded. Colour as in *A. novemfasciatus*, but the intermediate band between the first and second principal ones seem to be always present and there is generally a black blotch in the lateral line at base of caudal.

Habitat: Singapore; Banka; Lepar; Billiton; Bawean; Java; Borneo (Sipadan Island); Celebes; Talaut islands!; Karakelang islands!; Savu; Rotti!; Kei Islands!; New Guinea — Ceylon; Philippines; Coast of Australia; Tasmania; New Hebrides; Suva; Fidji.

Note. *Apogon schlegeli* Blkr. from Japan, which has been considered to be the same species, is probably different.

19. Apogon septemstriatus Gthr.

Apogon septemstriatus Günther, Challenger Report Zool. vol. I. 1880, p. 38.
Apogon septemstriatus Johnstone, Pearl Oyster Rep. II. Fishes 1904, p. 220.
Amia septemstriata Mc Culloch, Biol. Results „Endeavour" vol. III. 1915, p. 119.

D^1 VII; D^2 I. 8; A. II. 8; L.l. 28.

Height 2.5, equal to head. Praeoperculum serrated, its ridge smooth. Mouth very oblique, maxillary reaching to below middle of eye. Dorsal spines rather strong, the third and fourth equal in length. White (in spirits), with three well defined narrow black streaks on each side; the first from the snout, through the eye, along the middle of the tail and caudal fin; the second from the snout along the superciliary margin to the back of the tail; the third from the occiput along the base of the dorsal fins; a seventh stripe runs along the median line of the head and nape. No black round spot at the base of the caudal. A narrow blackish line along the base of the soft dorsal and anal fins. Length 85 mm. [After the description and figure of GÜNTHER, not seen by us].

Habitat: Arafura sea. — Ceylon, Queensland (near Bowen). In sea.

Note. This species seems to be allied to *A. chrysotaenia*, differing — if the figure (Günther, Challenger Report) is correct — by its very oblique mouth. The caudal is represented as almost truncate.

20. Apogon taeniatus C. V.

Apogon taeniatus Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 115.
Apogon taeniatus Rüppell, Atlas Reise N. Africa, Fische, 1828, p. 48 — Neue Wirbelthiere, Fische, 1837, p. 87.
Apogon bifasciatus Rüppell, Neue Wirbelthiere, Fische, 1837, p. 86.
Apogon trimaculatus Richardson, Ichth. China. Report 15th Meeting British Ass. 1846, p. 221 (nec C.V.).

Apogon Cantoris Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 479.
Apogon timorensis Bleeker, l.c. VI. 1854, p. 207.
? *Apogon bifasciatus* Günther, Cat. Brit. Mus. I. 1859, p. 238 [1]).
Apogon bifasciatus Kner, Novara Exp. Fische 1865—1867, p. 42.
Apogon bifasciatus Klunzinger, Abh. zool. bot. Gesellsch. Wien XX. 1870, p. 711.
Apogon taeniatus Klunzinger, l.c. p. 712.
Apogon bifasciatus Steindachner, Sitzber. Akad. Wien LX. I. 1870, p. 559.
Amia bifasciata Bleeker, Atl. ichth. VII. 1873—1876, p. 81.
Amia cantori Bleeker, l.c. p. 82.
Amia timorensis Bleeker, ibid.
Amia taeniata Bleeker, Nat. Verh. Holl. Maatsch. Wetensch. 3. verz. II, n° 1, 1874, Révision Apogon. p. 24.
Apogon taeniatus Day, Fishes of India 4°. 1875—1878, p. 59.
Apogon bifasciatus Day, l.c. p. 62. Suppl. p. 784.
Apogon bifasciatus Klunzinger, Fische des Rothen Meeres I. 1884, p. 21.
Apogon bifasciatus Sauvage, Poissons de Madagascar, 1891, p. 143.
Apogon (koilomatodon ?) M. Weber, Siboga Exp. Fische 1913, p. 222 (nec Bleeker).

D^1 VII; D^2 I. 9; A. II. 8; P. 2.12—13; V. I. 5; L.l. 26—28; L.tr. $\frac{(1\frac{1}{2})\ 2}{1}$ / 7.

Dorsal profile sloping gently from dorsal to snout. Height 2.5, 3.1 in length with caudal. Head 2.5, 3.2 in length with caudal. Eye 3.5, two thirds of eyediameter apart, equal to snout, more than snout in small specimens. Mouth oblique, maxillary reaching almost to below middle of eye. Two vertical rows of scales on praeoperculum, which is denticulated along its hindborder and the posterior part of the lower border. Praeopercular ridge smooth. Lower orbital rim rough, but without distinct denticulations. Praeorbital smooth. Conical teeth in bands in the jaws, that of the lower jaw narrower than that of upper jaw. Teeth on vomer in two rows, on palatines in a narrow band. Origin of first dorsal somewhat behind that of ventrals. Dorsal spines strong. First dorsal spine small, second one about one third of third one, which is very strong and longer than the others and equal to eye and snout. Fourth, fifth and sixth spine gradually decreasing in length, seventh much shorter. Spine of second dorsal equal to fourth spine of first dorsal and to postorbital part of head, longest soft rays equal to head without snout. Origin of anal below second soft dorsal ray. First anal spine minute, second

1) The description of the skeleton and of the colouring is more in accordance with that of *A. trimaculatus*, which has however six dorsal spines.

one equal to that of second dorsal. Soft anal rays somewhat shorter than those of dorsal. Pectorals and ventrals subequal, as long as head without snout. Caudal feebly incised, the lobes rounded. Tubes of lateral line in first part of body with forked ramifications. Least height of caudal peduncle more than 1.5 in its length, equal to postorbital part of head. Colour of alcohol specimens yellowish brown, silvery below. A black transverse band from origin of dorsal to halfway origin of ventrals and a second one from origin of second dorsal to halfway anus. A dark spot on the lateral line at base of caudal sometimes present. A dark streak from eye to angle of praeoperculum indistinct in large specimens. Membrane between third and fourth dorsal spine blackish. Second dorsal with a darkish band in the middle, parallel to the hindborder of the fins. Other fins and especially the ventrals more or less dusky in their distal half. Length 125 mm.

Habitat: Singapore; Bintang; Java; Borneo (Kota Baru!); Sulu islands!; Buton!; Timor; Savu!; Ambon!. — From Madagascar, Zanzibar, Red Sea, Persian Gulf to coast of British India and to China and Japan.

21. Apogon melas Blkr.

Apogon melas Bleeker, Journ. Indian Arch. II. 1848, p. 635. — Verh. Bat. Gen. XXII. Percoïden 1849, p. 29. — Act. Soc. Scient. Indo Neerl. I. 1856, Beschr. vischsoorten Amboina, p. 27.

Apogon hypselonotus Bleeker, Nat. Tijdschr. Ned. Indië VIII. 1855, p. 309.

Amia melas Bleeker, Verh. Holl. Maatsch. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 52. — Atl. ichth. VII. 1873—1876, p. 94.

Amia hypselonotus Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. 53. — Atl. ichth. VII. 1873—1876, p. 94.

Apogon melas M. Weber, Siboga Exp. Fische 1913, p. 230.

Apogon melas de Beaufort, Bijdr. tot de Dierkunde, Afl. 19, 1913, p. 115.

? *Amia melas* Fowler, Proc. Acad. Nat. Sci. Philad. LXX. 1918, p. 17 [1]).

D^1 VII—VIII [2]); D^2 I. 9; A. II. 8; P. 2.12; V. I. 5; L.l. 25—26; L.tr. $\frac{1\frac{1}{2}}{1}\cdot\frac{}{6\frac{1}{2}}$.

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1) Fowler describes here a young specimen of 55 mm. length, apparently in rather bad condition as: „*Amia melas* n.sp.". It may be a young of *Apogon melas* Blkr. The caudal is represented as rounded, but described in the text as damaged.

2) In one specimen of Bleeker's collection in the Leiden Museum there are 8 spines in first dorsal, in all others examined by us seven.

Dorsal profile arched, especially in large specimens. Height 2.3—3, 3—3.7 in length with caudal. Head 2.5—3, 3.1—3.7 in length with caudal. Eye 2.6—3, longer than snout, which is about equal to interorbital space and five sixths of eye. Mouth oblique, lower jaw somewhat prominent, maxillary reaching to below middle of eye or not so far. Two indistinct vertical rows of scales on praeoperculum, which is finely serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth, orbital rim narrow, scarcely rough. Height of praeorbital one third of eye. First dorsal spine minute, second one one third of third one or somewhat longer or shorter. Third one much stronger than the others, but generally not much longer than fourth and than first spine of second dorsal and about equal to eye and snout. Second anal spine long and slender, equal to postorbital part of head. Longest soft dorsal rays equal to head without snout, those of anal to snout and eye. Pectorals and ventrals subequal, somewhat more than eye and snout. Caudal feebly incised, the lobes rounded. Least height of caudal peduncle somewhat less than its length, equal to distance from hindborder of operculum to middle of eye. Colour of alcohol specimens dark brown, an oblique black stripe on cheeks from eye to edge of praeoperculum, not always distinct. All fins dusky or blackish, ventrals especially dark. Soft dorsal and anal with a more or less distinct rounded black blotch, sometimes encircled by white and forming an ocellus. Length 115 mm. [Specimens of BLEEKER's collection of *A. melas* and *A. hypselonotus* in the Leiden Museum and in the Zoological Museum of Amsterdam seen by us].

Habitat: Singapore!; Batu islands!; Nias!; Banka!; Billiton; Java (Patjitan; Prigi!); Bali!; Celebes (Menado!); Biaru!; Sumbawa!; Buru!; Timor!; Ambon!; Ceram!; Goram!; Ternate!; Kei islands!; Aru islands!; Waigeu!. — Philippines?

Note. We are of opinion, that *A. hypselonotus* can not be separated from *A. melas*. There is no difference in the length of the maxillary as stated by BLEEKER; the other differences mentioned by him are of no specific value. The typical specimen of *A. hypselonotus* shows the dark streak below the eye, not mentioned by BLEEKER, which are found in several specimens of *A. melas*. The ocellus on the second dorsal is

not always distinct, sometimes the whole fin is more or less blackish. *Apogon hypselonotus* Gthr. (Fische der Südsee I. 1873—1875, p. 20) is a different species, with 6 dorsal spines and placed by JORDAN & SEALE (Bull. Bureau Fisheries XXV (1905 1906, p. 245) in the synonymy of their *A. doryssa*. We suppose that *A. hypselonotus* Boulenger (Ann. Mag. Nat. Hist. (6) XX 1897, p. 372) from Rotuma is GÜNTHER's and not BLEEKER's species.

22. Apogon hartzfeldi Blkr.

Apogon Hartzfeldii Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 254. — Ibid. VI. 1854, p. 482.
Apogon hartzfeldii Günther, Cat. Brit. Mus. I. 1859, p. 242.
Amia Hartzfeldi Bleeker, Nat. Verh. Holl. Maatsch. Wetensch. 3de Verz. n° 1 (1873) 1874, Révision Apogon. p. 35. — Atl. ichth. VII. 1873—1876, p. 86.
Apogon hartzfeldi Steindachner, Abhandl. Senckenb. Naturf. Ges. XXV. 2. Heft, 1901, p. 417.
? *Amia cavitensis* Jordan & Seale, Bull. Bureau Fish. XXVI. (1906) 1907, p. 16.
Apogon Hartzfeldi M. Weber, Siboga Exp. Fische 1913, p. 223.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.11—12; V. I. 5; L.l. 25—26; L.tr. $\frac{1\frac{1}{2}}{1}$ / $\frac{}{6—7}$.

Oblong, head rather high. Dorsal profile slightly convex from occiput to dorsal. Height 2.7—3, 3.3—4.1 in length with caudal. Head 2.5—2.8, 3.4—3.6 in length with caudal. Eye 2.8—3.2, about three fourths eyediameter apart, longer than snout. Mouth somewhat oblique, maxillary reaching to below middle of eye, or farther back. Two indistinct rows of scales on praeoperculum, which is finely serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth, orbital rim rough, but without serrations. Conical teeth in bands of about five rows in jaws, in three rows on vomer, the posterior ones long and pointed and in a narrow band on palatines. First dorsal spine minute, second one two fifths of third, which is somewhat stronger and longer than fourth and slightly less than eye and snout. Spine of second dorsal equal to fourth one of first dorsal or a little less, longer than eye. Second anal spine equal to eye. Longest soft rays of dorsal shorter than those of anal, equal to length of pectorals and more than eye and snout. Ventrals about as long as longest soft anal rays and equal to snout and eye. Caudal

incised, the lobes somewhat pointed. Least height of caudal peduncle not quite 1,5 in its length, about equal to postorbital part of head. Colour of alcohol specimens yellowish brown, lighter below. A pearly narrow band from snout to upper half of eye, a similar one from anterior half of mouth to lower part of eye and indistinctly continued on opercles; an other pearly narrow band at some distance of dorsal profile, from occiput to end of second dorsal. Very indistinct broad darkish longitudinal bands on body. Base of caudal with a distinct black spot above and partly on lateral line. Caudal with dusky spots, first dorsal and posterior part of anal sometimes somewhat dusky. A narrow blackish basal band on dorsal and anal may be present. Length 114 mm.

Habitat: Siau!; Ternate; Obi!; Buru; Ambon; Goram; New Guinea (Doreh). — Philippines. In sea.

23. Apogon chrysopomus Blkr.

? *Apogon melanorhynchus* Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 255. — Act. Soc. Scient. Indo-Neerl. I. 1856, Beschrijving vischsoorten Amboina p. 26.
Apogon chrysopomus Bleeker, Nat. Tijdschr. Ned. Indië VII, 1854, p. 239.
Amia chrysopomus Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) (1874, Révision Apogon. p. 34. — Atl. ichth. VII. 1873—1876. p. 86.
? *Amia melanorhynchus* Bleeker, Atl. ichth. VII. 1873—1876, p. 90.
Amia urostigma Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 51. — Atl. ichth. VII. 1873—1876, p. 94.
Amia chrysopoma Evermann & Seale, Bull. Bureau Fisheries XXVI. (1906) 1907, p. 72.
Apogon melanorhynchus M. Weber, Siboga Exp. Fische, 1913, p. 227.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.12; V. I. 5; L.l. 25; L.tr. $\frac{2}{1}$.
$\frac{}{6}$

Height 2.6—3.3, 3.2—4 in length with caudal. Head 2.6—2.8, 3.2—3.6 in length with caudal. Eye 3.2, two thirds of their diameter apart. Snout about three fourths of eye. Mouth moderately oblique, maxillary reaching to below middle of eye or not quite so far. Villiform teeth in bands in jaws and vomer and in a narrower band on palatines. Jaws nearly equal, the lower jaw being somewhat included. Praeopercular border serrated, its ridge rough, but not serrated. Orbital rough but without serrations. First dorsal spine minute, second one less than half of third, which is longest and strongest

and equal to snout and eye together. Spine of second dorsal somewhat longer than second spine of anal, equal to postorbital part of head. Pectorals about equal to head without snout, ventrals shorter. Caudal feebly incised, with rounded lobes. Least height of caudal peduncle equal to postorbital part of head, 1.3 in its length. All the scales ctenoid. Colour of alcohol specimens brownish, a black spot at base of caudal just above lateral line. In young specimens a dark narrow band along back beginning on snout, another on median line of body may also be present, continued anteriorly on head and bordered below on snout by a margaritaceous band. Length 125 mm. [Types of *A. chrysopomus* and *A. urostigma* in the Leiden Museum seen by us].

Habitat: Singapore!; Bawean!; Celebes (Makassar!); Ambon!; Kei islands!. — Philippines. In sea.

Note. An examination of the type and only specimen known of *A. urostigma* in the Leiden Museum has shown us, that the praeopercular ridge is not at all serrated as described by BLEEKER, but is merely rough. The specimen agrees completely with the typical specimens of *A. chrysopomus*, with which we compared it. The only difference between the two is the lack of the longitudinal bands on the body, but these two are only visible on the smaller specimens of *A. chrysopomus* and only traces of them are left on the larger specimen, which may however have faded through time. EVERMANN & SEALE l. c. also describe two „very indistinct dusky longitudinal lines". We suppose therefore that these bands fade already when the specimens grow older, and that they disappear quite in large specimens, as in the type of *A. urostigma*.

The specimen described by one of us as *A. melanorhynchus* from the Siboga Expedition agrees with the smaller specimens of *A. chrysopomus* of BLEEKER's collection, which is more slender than the older specimen. We are not sure if BLEEKER's *A. melanorhynchus* is this same species. The specimens of this species of BLEEKER's collection in the Leiden Museum are in bad condition; almost nothing is to be seen of the colour or markings. The specimens vary considerably, some may belong to *A. frenatus*, others to *A. chrysopomus*, but as BLEEKER used to put all the specimens of one species in one jar, it can not be ascertained anymore which is the type.

24. Apogon chrysotaenia Blkr.

Apogon multitaeniatus Bleeker, Journ. Ind. Arch. II. 1848, p. 635. — Verh. Bat. Gen. XXII. 1849, Bijdr. Percoïden, p. 28 (nec C.V.).
Apogon chrysotaenia Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 168.
Apogon cyanotaenia Bleeker, l.c. V. 1853, p. 71.
Amia multitaeniata Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 233 (name only).
Amia multilineata Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 188. — Nat. Verh. Holl. Maatsch. v. Wetensch. 3de verz. II. n° 1, 1874, Révision Apog. p. 29. — Atl. ichth. VII. 1873—1876, p. 83.
? *Apogon chrysotaenia* Day, Proc. Zool. Soc. London 1870, p. 682.
Amia chrysotaenia Bleeker, Nat. Verh. Holl. Maatsch. 3de Verz. II. n° 1, 1874, Révision Apog. p. 30. — Atl. ichth. VII. 1873—1876, p. 84.
Amia cyanotaenia Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1, 1874, Révision Apogon. p. 33. — Atl. ichth. VII. (1873—1876), p. 85.
? *Apogon wassinki* Day, Fishes of India 4°, 1875—1878, p. 61.
Apogon chrysotaenia Steindachner, Abhandl. Senckenb. Naturf. Gesellsch. XXV. 2. Heft, 1901, p. 416.
Amia multilineata Radcliffe, Proc. U.S. Nat. Mus. vol. 41, 1912, p. 259.
Apogon multilineatus M. Weber, Siboga Exp. Fische 1913, p. 223.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.11—12; V. I. 5; L.l. 26—28; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\overline{7}$

Height 2.9—3.2, 3.6—3.9 in length with caudal. Head 2.5—2.9, 3.1—3.8 in length with caudal. Eye 2.5—3. Snout equal to about two thirds of eye, somewhat longer than interorbital space. Mouth somewhat oblique, maxillary reaching to below middle of eye. Praeoperculum denticulated along its hind- and lower border. Praeopercular ridge and suborbitals with rough borders, but without serrations. Praeorbital smooth. Conical teeth in several rows in the jaws, in a narrow band on vomer and on palatines. First dorsal spine minute, second one half as long or somewhat less than third one, which is stronger than the others, but not much longer than the fourth and equal to snout and eye or shorter. Spines of second dorsal equal to fourth spine of first dorsal or somewhat shorter, equal to postorbital part of head. First anal spine minute, second one as long as snout or as eye. Longest soft rays of anal shorter than those of dorsal, which are equal to head without snout. Origin of anal below anterior half of second dorsal. Caudal incised, the lobes rounded. Pectorals and ventrals subequal, as long as postorbital part of head and half diameter of eye together. Least height of caudal peduncle about 1.5 in its length and equal to postorbital part of head. Colour

of alcohol specimens yellowish brown, head dark brown, lighter below. A silvery stripe from snout through eye to hindmargin of operculum, an other median one from snout, diverging before eye and running above eye to occiput, a third one below eye, from maxillary to base of pectorals. Operculum with some darkbrown spots. Body with more or less distinct longitudinal brown bands, according to the rows of scales and often with narrower ones between them. A faint indication of a median spot on caudal peduncle at base of caudal. Fins hyaline or with dusky margins at hinderborder of soft dorsal and anal. [Types of *A. chrysotaenia, A. cyanotaenia* and *A. multilineatus* in the Leiden Museum seen by us]. Length 90 mm.

Habitat: Java (Batavia!); Celebes (Menado); Bima!; Saleyer!; Sulu islands!; Sumbawa!; Flores!; Timor!; Solor; Ceram!; Ternate!; Ambon!; Nusa laut!; Goram!; Kei islands!; Aru islands!. — Philippines.

Note. We have examined the types of the three species of BLEEKER, mentioned in the synonymy. The colours are faded in these specimens, excepting the silvery stripes on the head, which are still visible in the types of *A. cyanotaenia* and *A. multilineatus* and of which only traces could be found in one of the typical specimens of *A. chrysotaenia*. The dark bands on the body are clearly visible in *A. multilineatus*, but only very faint indications of them in the two others. The figures in the Atlas ichthyologique, as most of those of the genus *Apogon*, are bad and often incorrect.

The specimens described by DAY l. c. first as *chrysotaenia* and afterwards as *wassinki* probably belong to the former, as *wassinki* (= *cyanosoma*) has only 23 scales in the lateral line.

25. Apogon cyanosoma Blkr.

Apogon cyanosoma Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 71.

Apogon Wassinki Bleeker, l.c. XXII. 1860, p. 257.

Apogon cyanosoma Playfair, Fishes of Zanzibar 1866, p. 20. — Proc. Zool. Soc. London 1867, p. 850.

? *Apogon cyanosoma* Klunzinger, Abhandl. zool. bot. Gesellsch. Wien Bd. XX. 1870, p. 714.

Amia cyanosoma Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1, Révision Apogon. (1873) 1874, p. 37. — Atl. ichth. VII. 1873—1876, p. 87.

Amia Wassinki Bleeker. Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1, Révision Apogon. (1873) 1874, p. 38. — Atl. ichth. VII. 1873—1876, p. 88.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.11—12; V. I. 5; L.l. 23; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{7}$

Height 2.7—3.2, 3.4—4.1 in length with caudal. Head 2.4—2.8, 3—3.6 in length with caudal. Eye 2.6—2.8. Interorbital space half diameter of eye or a little more. Snout about two thirds of eye. Mouth oblique, maxillary reaching to below middle of eye. Lower jaw the longer, chin prominent. Small teeth in a few rows in jaws, in one or two rows on vomer and palatines. Hind- and lower border of praeoperculum serrated, praeopercular ridge, praeorbital and orbital rim smooth. First dorsal spine minute, second one about half length of third, which is not much stronger than the others and somewhat more than postorbital part of head. Spine of second dorsal somewhat more than, second spine of anal equal, to eye. Pectorals almost equal to head without snout, ventrals equal to eye and snout. Caudal incised, with rounded lobes. All scales ctenoid. Colour of alcohol specimens brown, with traces of lighter longitudinal bands. Length 68 mm. [Types of *A. cyanosoma* and *A. wassinki* in the Leiden Museum seen by us].

Habitat: Solor!; Timor!. — Seychelles, Coast of Zanzibar, Red Sea?. In sea.

Note. The type of *A. cyanosoma* is in rather bad state, that of *A. wassinki* is better preserved. We count only 23 scales in the lateral line in lastnamed species and not 25 or 26 as indicated by BLEEKER. We see no reason to separate the two species mentioned. *A. cyanosoma* is characterized by the lower number of scales in the L.l. and by the prominent lower jaw and chin. We are not sure if the specimens mentioned by KLUNZIGER l. c. are of the same species, as he counts 24 + 2 scales in the L.l. and calls the band of teeth in the lower jaw broad, whereas we find only a few rows in *cyanosoma*.

26. **Apogon hoeveni** Blkr. [Fig. 74, p. 277].

Apogon Hoevenii Bleeker, Nat. Tijdschr. Ned. Indië VI. 1854, p. 483.
Amia Hoevenii Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. II. n° 1 (1873) 1874. Révision Apogon. p. 49. — Atl. ichth. VII. 1873—1876, p. 93.
Apogon Hoevenii M. Weber, Siboga Exp. Fische 1913, p. 228.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.10; V. I. 5; L.l. 24—25; L.tr. $\frac{1\frac{1}{2}}{6}$.

Dorsal profile ascending rather steeply to dorsal in an almost straight line. Height 2.3—2.6, 3—3.3 in length with caudal. Head 2.2—2.6, 3.1—3.2 in length with caudal. Eye 2.4—2.8. Snout about equal to interorbital space and about two thirds of eye. Mouth oblique, chin somewhat prominent. Maxillary reaching to below hindborder of pupil, its height posteriorly 2.4—2.5 in eye. Praeoperculum serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth, orbital rim somewhat rough. First dorsal spine minute, second one about one third of third one, which is somewhat longer than fourth and about equal to distance between hindborder of operculum and hindborder of pupil. Length of spine of second dorsal between that in fourth and fifth of first dorsal; longer than second anal spine, which is equal to eye. Longest rays of soft dorsal equal to snout and eye, shorter than those of anal and equal to pectorals, which are somewhat shorter than ventrals. Caudal feebly incised. Bands of villiform teeth in the jaws, in a few rows on vomer and palatines. Least height of caudal peduncle 1.4—1.6 in its length, equal to postorbital part of head. Colour of preserved specimens yellowish or brownish, more or less silvery below. Fins hyaline. First dorsal with a black patch superiorly between third and fourth spine. A brown spot between sixth and seventh spine and sometimes less distinct ones between the other spines. Similar indistinct spots may be present between the rays of the soft dorsal, forming an indication of a subbasal longitudinal bar. Length over 100 mm.

Habitat: Singapore; Sumatra, (Trussan); Banka; Bawean; Bali; Sumbawa!; Flores!; Timor; Celebes (Badjoa, Menado, Tanawanko, Gorontalo); Buton!; Sangir islands; Ceram; Ambon; Goram; Ternate; Banda; Kei islands! — Cocos island. In sea.

Buccal incubation has been observed in this species by one of us (Siboga Exp. Fische l. c.). See Fig. 74.

27. Apogon bandanensis Blkr.

? *Apogon fuscus* Quoy & Gaimard, Voyage de l'Uranie et de la Physicienne, Zoologie 1824, p. 345.

Apogon bandanensis Bleeker, Nat. Tijdschr. Ned. Indië VI. 1854, p. 95.

Apogon monochrous Klunzinger, Abh. zool. bot. Ges. Wien XX. 1870, p. 715 (nec Bleeker).
Apogon savayensis Günther, Proc. Zool. Soc. 1871, p. 656.
Apogon savayensis Günther, Fische der Südsee I. 1873—1875, p. 21.
Amia bandanensis Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1, Révision Apogon. (1873) 1874, p. 456. — Atl. ichth. VII. 1873—1876, p. 82.
Apogon savayensis Day, Fishes of India 4°. 1875—1878, p. 60.
Apogon bandanensis Klunzinger, Fische des Rothen Meeres I. 1884, p. 21 (nec syn.).
Apogon bandanensis Day, Fishes of British India 8°. vol. I. 1889, p. 495.
Apogon (*batjanensis* Blkr.) M. Weber in Semon, Zool. Forschgsreisen in Austral. u. d. Malay. Archipel 1895, p. 263 [1]).
Apogon savayensis Seale, Occas. Papers P. Bish. Mus. Hawaii, I. 1901, p. 76.
Apogon nubilus Garman, Bull. Mus. Harv. Coll. XXXIX. n° 8, 1903, p. 229 (fide Jordan & Seale).
Amia savayensis Jordan & Seale, Bull. Bureau Fish. XXV. (1905) 1906, p. 239.
Apogon bandanensis M. Weber, Siboga Exp. Fische 1913, p. 222.
Apogon savayensis de Beaufort, Bijdr. tot de Dierkunde, Afl. 19, 1913, p. 115.
Amia savayensis Fowler, Proc. Acad. Nat. Sci. Philadelphia LXX. 1918, p. 27.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.11; V. I. 5; L.l. 25—27; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{6\frac{1}{2}}$

Dorsal profile rather arched, profile of head rounded. Height 2.4—2.8, 3.1—3.5 in length with caudal. Head 2.4—2.7, 3—3.4 in length with caudal. Eye large 2.1—2.5. Snout equal to half eye or a little longer. Interorbital space about five eighths of eye. Mouth oblique, lower jaw somewhat prominent. Maxillary reaching to below hindborder of pupil. Height of maxillary posteriorly thrice in eye. Praeoperculum finely serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth, orbital rim narrow, scarcely rough. First dorsal spine minute, second one one third or a little less than one half of third one, which is somewhat longer, but not stronger than fourth and equal to snout and eye or somewhat shorter. Spine of second dorsal equal to fourth spine of first dorsal and to postorbital part of head or a little shorter. Second anal spine about equal to eye. Longest soft rays of dorsal somewhat longer than those of anal and equal to distance between hindborder of operculum and middle or frontborder of pupil, and about as long as pectorals, which are somewhat longer than ventrals. Caudal feebly incised, the lobes rounded. Teeth in two or three rows in jaws, in an indistinct double row on

1) *A. batjanensis* Blkr. is a misprint for *A. bandanensis* Blkr. — *A. batjanensis* does not exist.

vomer and in a single row on palatines. Least height of caudal peduncle about 1.3 in its length, equal to postorbital part of head. Colour of preserved specimens brownish, silvery below. Cloudy dark brown patches below first and second dorsal, not always distinct. A dark brown band on caudal peduncle, at some distance of base of caudal, sometimes only present on upper part of peduncle and forming a saddle; sometimes better developed but never apparently encircling the whole peduncle and in other specimens very indistinct. A narrow black oblique streak from eye to corner of praeoperculum. Front part of first dorsal dark; second dorsal and anal somewhat dusky. Pectorals and ventrals colourless. In some specimens, preserved in formaline, there are about nine dark transverse bands visible on the body, as broad as the interspaces. [Specimen of BLEEKER's collection in the Zoological Museum of Amsterdam seen by us]. Length 100 mm.

Habitat: Pulu Weh!; Singapore; Sumatra (Trussan, Ulakan); Billiton; Pulu Kelapa!; Bawean; Celebes (Menado!, Gorontalo); Biaru!; Siau!; Sangir islands; Sulu islands!; Saleyer!; Flores; Savu!; Solor!; Timor!; Rotti!; Buru; Ceram; Ambon; Goram; Banda; Obi!; Batjan; Ternate; Waigeu!; Aru-islands!; New Guinea (Doreh, Atjatuning!). — Red Sea, coast of British India, Philippines, Riu-Kiu islands, North Queensland, South Pacific Islands, eastwards to Paumotu Islands. — In sea.

28. Apogon aureus (Lac.)

? *Ostorhinchus Fleurieu* Lacépède, Hist. Nat. Poissons III. 1802, tab. 32, fig. 2. — l.c. IV. 1802, p. 24.

? *Dipterodon hexacanthus* Lacépède, l.c. III. 1802, tab. 30, fig. 2. — l.c. IV. 1802, p. 166, 168.

Centropomus aureus Lacépède, l.c. IV. 1802, p. 253, 273.

Apogon roseipinnis Cuvier & Valenciennes, Hist. nat. Poissons III. 1829, p. 490; VI. 1830, p. 553.

Apogon annularis Rüppell, Atlas Reise N. Afrika, Fische, 1826—1831, p. 48. — Neue Wirbelthiere 1835—1840, Fische, p. 85.

Apogon roseipinnis Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 253.

Apogon roseipinnis Peters, Monatsber. Akad. Berlin 1855, p. 428.

Apogon annularis Günther, Cat. Brit. Mus. I. 1859, p. 239.

Amia aurea Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 284.

Apogon annularis Klunzinger, Abhandl. zool. bot. Gesellsch. Wien Bd. XX. 1870, p. 713.

Amia annularis Bleeker, Ned. Tijdschr. Dierk. IV. 1873, p. 137 (name only).

Amia aurea Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 48. — Atl. ichth. VII. 1873—1876, p. 92.

Apogon aureus Day, Fishes of India 4°. 1875—1878, p. 61.
Apogon aureus Klunzinger, Fische des Rothen Meeres I. 1884, p. 22.
Apogon aureus Sauvage, Poissons de Madagascar 1891, p. 142.
Amia fleurieu Jordan & Seale, Bull. Bur. Fish. XXV. (1905) 1906, p. 244.
Apogon aureus M. Weber, Siboga Exp. Fische 1913, p. 228.
Amia fleurieu Ogilby, Mem. Queensl. Mus. vol. V. 1916, p. 182.

D^1 VII; D^2 1.9; A. II.8; P. 2.11; V. I.5; L.l. 26—27; L.tr. $\frac{2}{1}$.
$6\frac{1}{2}$

Dorsal and ventral profile arched. Height 2.1—2.3, 2.6—2.8 in length with caudal. Head 2.5—2.7, 3.1—3.4 in length with caudal. Eye 2.7—3. Snout equal to interorbital space and three quarters of eye. Mouth oblique, lower jaw somewhat prominent. Maxillary reaching to below hindborder of pupil. Height of maxillary posteriorly 2—2.5 in eye. Praeoperculum finely serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth, orbital rim somewhat rough, but without serrations. First dorsal spine minute, second one less than half third spine, which is equal to fourth and to eye and snout. Length of spine of second dorsal between that of fifth and sixth spine of first dorsal, as long as second anal spine and equal to eye or a little longer. Longest soft rays of dorsal shorter than those of anal and about equal to distance between hindborder of operculum and frontborder of pupil. Pectorals equal to head without snout, subequal to or longer than ventrals. Caudal feebly incised, the lobes rounded. Teeth in the jaws in narrow bands of two to three rows; in an indistinct double row on vomer and on palatines. Least height of caudal peduncle 1.1 in its length, scarcely longer than postorbital part of head. Colour of preserved specimens yellowish brown, lighter and somewhat silvery below. A dark stripe from snout to lower part of eye and another running from snout over maxillary often bluish. A more or less distinct dark longitudinal stripe from hindborder of eye to hindborder of operculum. Caudal peduncle at base of caudal encircled by a broad darkbrown band. Anterior part of first dorsal somewhat dusky. Base of anal with a row of dark spots between the rays. Base of upper and lower caudal rays dark brown, connected with the band on caudal peduncle. Fins light yellowish. Length 128 mm. [Specimens of BLEEKER's collection in the zoological Museum of Amsterdam seen by us].

Nomen indig.: Bibisang (Batjan), Geteh-geteh lolaro (Menado).

Habitat: Pulu Weh!; Saleyer!; Celebes (Menado, Badjoa); Flores; Solor; Banda!; Buru; Ambon; Ceram!; Ternate; Batjan; Waigeu!; Rawak; New Guinea (Doreh, North New Guinea!, British New Guinea). — From Natal and Madagascar, Red Sea, coasts of British India to China and to Darnley Island.

29. Apogon nigripinnis C.V.

Apogon nigripinnis Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 113.
Apogon nigripinnis Schlegel, in Fauna Japonica, 1846, p. 3.
Amia nigripinnis Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 64. — Atl. ichth. VII. 1873—1876, p. 99.
Apogon nigripinnis Day, Fishes of India 4°. 1875—1878, p. 60.
Apogon nigripinnis Steindachner & Döderlein, Denkschr. Akad. Wien XLVIII. 1883, p. 1.
Apogon niger Jordan & Snyder, Proc. U.S. Nat. Mus. XXIII. 1901, p. 895.
Apogon nigripinnis Regan, Journ. Bomb. Nat. Hist. Soc. XVI. 1905, p. 330.
Amia niger Smith & Pope, Proc. U.S. Nat. Mus. XXXI. 1906, p. 468.
Amia nigra Snyder, Proc. U.S. Nat. Mus. vol. 42, 1912, p. 412.
Amia nigra Jordan, Tanaka & Snyder, Journ. Coll. Sci. Univ. Tokyo vol. XXXIII. Art. 1, 1913, p. 139.

D^1 VII; D^2 I.9; A. II.8; P. 15; V. I.5; L.l. 26; L.tr. $2\frac{1}{2}/6\frac{1}{2}$.

No very considerable rise from the snout to the base of the dorsal fin, snout rather elevated. Height about equal to head, 2.5—2.6, 3—3.2 in length with caudal. Eye 3—3.2. Snout one half or two thirds of eye. Interorbital space three fourths of eye. Mouth very oblique, maxillary reaching to below last third or even hindborder of eye. Lower jaw slightly the longer. Vertical and horizontal limbs of praeoperculum strongly and evenly serrated along their outer edges. Teeth villiform in jaws, vomer, and palate, an outer slightly enlarged row in each jaw. First and second dorsal spine small, third almost as long as fourth, which is equal to postorbital part of head. Second dorsal somewhat higher than first dorsal and than anal. Ventrals longer than pectorals, reaching anal. Caudal rounded. Colour greyish, a dark vertical band from in front of base of first dorsal passes backwards and downwards, increasing in width to behind pectoral fin; a second from base of second dorsal to lateral line, and a third over free portion of tail. No black spots or streaks on the head, vertical fins black except the caudal, which is yellow and has a dark edge. Length 90 mm. [Not seen by us; after DAY, who has compared the type specimen in the Paris-Museum].

Habitat: Java; Borneo. — Zanzibar, Persian Gulf, Madras, Pondicherry, Japan. In sea.

30. Apogon melanopus M. Web. [Fig. 73, p. 277].

Apogon melanopus M. Weber, Abhandl. Senckenb. Naturf. Gesellsch. XXXIV. 1911, p. 28.

D^1 VII; D^2 I.9; A. II.9; P. 15; L.l. 26—27; L.tr. $\frac{2\frac{1}{2}}{1}$. $\frac{}{7}$

Dorsal profile from snout to dorsal feebly convex, especially on the snout. Height 2.5, 3.3 in length with caudal. Head 2.7, 3.5 in length with caudal. Eye 3.2. Snout equal to feebly convex interorbital space and seven eighths of eye. Mouth very oblique. Jaws equal. Maxillary not quite reaching to below hindborder of eye, its height posteriorly about three fourths of pupil. Orbital rim with some small teeth inferiorly and posteriorly. Praeoperculum serrated ventrally, the serrations getting coarser along the rounded edge. Praeopercular ridge with about three strong teeth. Operculum with a feeble blunt spine. Nape with longitudinal skinfolds, increasing in number posteriorly. First dorsal two thirds length of second, its spines weak, the third one about equal to postorbital part of head. Anal somewhat less high than second dorsal. Pectorals reaching to vertical through second anal spine, as long as ventrals and equal to two thirds of head. Caudal incised, with apparently pointed lobes. Least height of caudal peduncle about 1.5 in its length, which is equal to distance between frontborder of eye and hindmargin of operculum. Scales ctenoid. Colour of alcohol specimen brownish yellow; head darker, belly silvery. A very faint indication of a dark transverse band below first dorsal and about as broad as base of the fin. A similar band at the origin of the caudal. Several scales powdered with dark, especially along the lateral line. Membranes of unpaired fins dark, pectorals hyaline. Ventrals black. A blackish spot at the end of the base of second dorsal and anal. Length of single specimen known 92 mm. [Type in the Senckenberg Museum at Frankfort].

Habitat: Aru islands! Brackish water.

31. Apogon moluccensis Val.

? *Apogon cupreus* Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 158.
Apogon moluccensis Valenciennes, Nouv. Arch. Mus. Hist. Nat. 1832, p. 54.

? *Apogon nigripinnis* Bleeker, Journ. Ind. Arch. III. (1848) 1849, p. 66.
Apogon chrysosoma Bleeker, Nat. Tijdschr. Ned. Indie III. 1852, p. 256.
Apogon monochrous Bleeker, Act. Soc. Scient. Indo-Neerl. I. 1856, Beschr. vischfauna Manado, p. 34.
Apogon moluccensis Bleeker, Nat. Tijdschr. Ned. Indië XV. 1858, p. 199.
Apogon monochrous Günther, Cat. Brit. Mus. I. 1859, p. 236.
Amia monochrous Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 284.
? *Apogon fuscus* Günther, Fische d. Südsee I. 1873—1875, p. 22 (nec Q. G.).
Amia moluccensis Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3e Verz. II. n° 1, (1873) 1874, Révision Apogon. p. 50, 51. — Atl. ichth. VII. 1873—1876, p. 93.
Apogon moluccensis M. Weber, Siboga Exp. Fische 1913, p. 229.

D^1 VII; D^2 I.9; A. II.8; P. 2.12; V. I.5; L.l. 26—27; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{6\frac{1}{2}}$

Dorsal and ventral profile evenly convex. Height 2.7—2.8, 3.3—3.4 in length with caudal. Head 2.6—2.8, 3.3—3.5 in length with caudal. Eye 2.7—3.1. Snout about equal to interorbital space and about two thirds of eye. Mouth oblique, lower jaw slightly prominent. Maxillary reaching to below hindborder of pupil or farther. Praeoperculum finely serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth, orbital rim narrow, scarcely rough. First dorsal spine minute, second one equal to half length of third or somewhat shorter. Third one scarcely longer than fourth, somewhat more than postorbital part of head. Length of spine of second dorsal between that of fourth and fifth of first dorsal, longer than second anal spine, which is equal to eye. Longest rays of soft dorsal equal to snout and eye, those of anal shorter, equal to postorbital part of head. Pectorals equal to distance between hindmargin of operculum and middle or frontborder of pupil, ventrals about one half eye shorter. Caudal very feebly incised, with rounded lobes. Teeth in a few rows in jaws, in an indistinct double row on vomer and in a single series on palatines. Least height of caudal peduncle about 1.5 in its length, equal to or shorter than postorbital part of head. Colour of preserved specimens reddish brown, head and body covered by numerous dark spots, which are also visible on the fins and arranged on the caudal in numerous parallel transverse rows, on the second dorsal forming an indistinct subbasal band. Upper part of first dorsal blackish. [Specimen of BLEEKER's collection in Zoological Museum of Amsterdam and in the Leiden Museum seen by us]. Length 85 mm.

Habitat: Singapore; Nias!; Sumatra (Trussan); Banka;

Java (Surabaya!); Bawean; Bali; Celebes (Menado, Tanawanko, Badjoa, Gorontalo); Sangir; Ceram!; Ambon; Goram; Timor. — Coast of Natal, Cocos islands, Philippines and China, Fidji islands.

Note. We do not think that GÜNTHER was right in referring *Apogon fuscus*, described by QUOY & GAIMARD from Guam (Zoologie Voyage de l'Uranie et de la Physicienne 1824, p. 345) to this species. The large eye and the „tache noirâtre demi-transversale" on the caudal peduncle points more to *A. bandanensis*, which species is known to occur at Guam. The species described by JORDAN & SEALE (Bull. Bureau Fish. XXV. (1905) 1906, p. 244) as *Amia fusca* (Q. G.), is certainly not this species as it has six spines in the first dorsal.

Among the numerous specimens of *Apogon moluccensis* of BLEEKER's collection in the Leiden Museum we found that a great many did not belong to this species, but to *Apogon apogonides* Blkr. It is curious that BLEEKER made this mistake. Probably he was misled by the fact, that he described *A. apogonides* as a species with six dorsal spines. There are however seven spines in the type specimen in the Leiden Museum. We do not think that the specimens of *A. apogonides* were put by mistake into the jar with *A. moluccensis* afterwards, as the largest specimen of *A. moluccensis* mentioned by BLEEKER in the Atlas is of 101 mm. length and a specimen of exactly that size, by far the largest among the others, is present in BLEEKER's collection as *A. moluccensis*, but it is certainly *A. apogonides*.

We are therefore not sure about the localities of *A. moluccensis* mentioned by BLEEKER. We enumerated all those given by him, but some of them may have reference to *A. apogonides*.

32. Apogon apogonides (Blkr.)

Cheilodipterus apogonides Bleeker, Act. Soc. Sc. Indo-Neerl. I. 1856, Beschr. vischfauna Manado, p. 37.

Amia apogonides Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1, 1873 (1874), Révision Apogon. p. 58. — Atl. ichth. VII. 1873—1876, p. 97.

Apogon apogonides M. Weber, Siboga Exp. Fische, 1913, p. 230.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.12; L.l. 26—27; L.tr. $\frac{1\frac{1}{2}}{6\frac{1}{2}}$.

Height 2.8, 3.3 in length with caudal. Head 2.4—2.6, 3 in

length with caudal. Eye 3—3.3. Snout shorter than eye. Interorbital space two thirds or three fourths of eye. Mouth oblique, lower jaw slightly prominent. Maxillary reaching to below hindborder of pupil. Praeoperculum serrated along its hind- and lower border. Praeopercular ridge and praeorbital smooth. First dorsal spine minute, second one about equal to half length of third, which is about as long as fourth and as postorbital part of head. Spine of second dorsal somewhat longer than second anal spine, which is equal to eye. Longest soft rays of dorsal somewhat longer than those of anal, which are equal to eye and snout. Pectorals equal to postorbital part of head and half diameter of eye, ventrals somewhat shorter. Caudal incised, the lobes pointed. Teeth in the jaws rather large, caninoid, hooked, in several rows. Teeth on vomer in an indistinct double row, in a single row on palatines. Colour of preserved specimens brownish, minutely freckled with black. A black band from snout to eye. Upper part of first dorsal black. Hindborder of caudal dusky. Length over 100 mm. [Type in the Leiden Museum seen by us].

Habitat: Singapore; Pulu Weh!; Celebes (Manado!); Banda!. In sea.

Note. We have already mentioned under *A. moluccensis* that BLEEKER has confounded this species with. *A. apogonides*. Several of the localities mentioned by him for *A. moluccensis*, are probably referable to *A. apogonides*. The two species can easily be distinguished by the teeth and the form of the caudal fin.

33. Apogon auritus C. V.

Apogon auritus Cuvier & Valenciennes, Hist. Nat. Poissons VII. 1831, p. 443.
Apogon variegatus Valenciennes, Nouv. Ann. Mus. d'hist. nat. I. 1832, p. 55.
Apogon punctulatus Rüppell, Neue Wirbelth. Fische 1837, p. 88.
Apogon punctulatus Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 696.
Apogonichthys polystigma Bleeker, l.c. VI. 1854, p. 484.
Apogonichthys auritus Günther, Cat. Brit. Mus. I. 1859, p. 246.
Apogonichthys auritus Playfair, Fishes of Zanzibar 1866, p. 21.
Apogon (Apogonichthys) auritus Klunzinger, Abh. zool. bot. Ges. Wien XX. 1870, p. 709.
Apogonichthys punctulatus Bleeker, Versl. Akad. Amsterdam (2) VII (1872) 1873, p. 38.
Amia polystigma Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 67. — Atl. ichth. VII. 1873—1876, p. 101.

Apogon auritus Günther, Fische der Südsee I. 1873—1875, p. 23.
Amia aurita Bleeker, Recherches s. l. faune de Madagascar 4. Partie, Poissons, Leide 1875. p. 93 (name only).
Amia variegata Bleeker, ibid. (name only).
Apogon auritus Day, Fishes of India 4° 1875—1878, p. 63.
Apogonichthys marmoratus Alleyne & Macleay, Proc. Linn. Soc. N. S. Wales I. 1877, p. 268.
Apogon auritus Klunzinger, Sitzber. Akad. Wien 1880, p. 344.
Apogonichthys polystigma Macleay, Descr. Cat. Austr. Fish. I. 1881, p. 47.
Apogonichthys marmoratus Macleay, ibid. p. 48.
Apogonichthys polystigma Macleay, Proc. Linn. Soc. N. S. Wales IX. 1884, p. 8.
Apogonichthys auritus Steindachner, Sitzber. Akad. Wien 1. Abth. (1883) 1884, p. 1066.
Apogon (Apogonichthys) auritus Klunzinger, Fische des Rothen Meeres I. 1884, p. 19.
Apogon auritus Sauvage, Poissons de Madagascar 1891, p. 141.
Apogon (Apogonichthys) auritus Pfeffer, Jahrb. Hamb. wissensch. Anstalt. X. 1893, p. 7.
Apogon auritus Seale, Occas. Papers B. P. Bish. Mus. I, 1901, p. 76.
Apogon auritus Borsieri, Ann. Mus. Genova (3) I. 1904, p. 191.
Apogonichthys variegatus Jordan & Seale, Bull. Bureau Fish. XXV. (1905) 1906, p. 250.
Apogonichthys marmoratus Jordan & Seale, ibid.
Apogonichthys isostigma Jordan & Seale, l. c. p. 251.
Apogonichthys auritus Ogilby, Proc. Roy. Soc. Queensland XXI. 1908, p. 24.
? *Apogon variegatus* Tate Regan, Trans. Linn. Soc. London (2) XII. 1908, p. 224.
Apogon punctulatus Kendall & Goldsborough, Memoirs Mus. Comp. Zool. Harvard Coll. XXVI. N° 7, 1911, p. 278.
Apogon auritus M. Weber, Siboga Exp. Fische 1913, p. 232.
Apogon variegatus Bamber, Journ. Linn. Soc. Zool. XXXI. 1915, p. 480.

D^1 VII; D^2 I. 9; A. II. 8; P. 1.11; L.l. 23—24; L.tr. $\frac{1\frac{1}{2}}{1}$. $\frac{}{6}$

Oblong, dorsal profile evenly rounded. Height 2.6—2.7, 3.3—3.4 in length with caudal. Head 2.3—2.4, 2.8—3 in length with caudal. Eye about 3. Snout blunt, 1.6 in eye. Interorbital space narrow, more than twice in eye. Maxillary reaching almost or quite to below hindborder of eye. None of the bones of the head serrated. First dorsal spine minute, second one about half length of third, which is stronger and longer than the others, as long as longest soft rays of second dorsal and equal to eye and snout. Spine of second dorsal longer than second spine of anal and equal to diameter of eye. Longest soft anal rays somewhat shorter than those of dorsal. Pectorals and ventrals subequal, equal to distance from hindborder of operculum to pupil. Caudal rounded. Least height of caudal peduncle somewhat less than its length, less than

postorbital part of head. Lateral line with tubes from head to 7th or 9th scale, the others with an opening only. Minute villiform teeth in jaws. Colour of preserved specimens yellowish brown, the body sometimes with rather faint darker crossbars, sometimes uniform. A few dark streaks on cheek radiating from eye. A large round darkbrown or blackish ocellus on operculum, encircled by white, above it a darkbrown streak. Fins light yellowish. Length to almost 80 mm.

Habitat: Singapore; Sumatra (Priaman); Java-sea; Sangir-islands; Celebes (Tanawanko, Kwandang bay!); Ternate; Buru; Ceram; Ambon!; Banda!; Aru islands; New Guinea (Strait Galewo!). — From Madagascar, Mauritius, Isle de France, coast of East Africa, Red Sea, coasts of India; Philippines; coasts of North Australia, eastwards to Samoa and Tonga-islands. In sea.

34. Apogon ocellatus M. Web.

Apogon ocellatus M. Weber, Siboga Exp. Fische 1913, p. 231.

D^1 VII; D^2 I. 9; A. II. 8; P. 1.12; V. I. 5; L.l. 22—24; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{6}$

Dorsal profile convex, sloping in an almost straight line from dorsal to snout. Height 2.7—3, 3.3—3.8 in length with caudal. Head 2.4—2.6, 2.9—3.1 in length with caudal. Eye 3—3.5. Snout blunt, 1.6—2 in eye. Interorbital space narrow, more than twice in eye. Mouth somewhat oblique, jaws equal. Maxillary reaching to below hindmargin of eye, its height posteriorly a little more than half diameter of eye. None of the bones of the head serrated. Orbital rim rough. First dorsal spine minute, second one about half length of third, which is longer and stronger than the others and equal to snout and eye. First spine of second dorsal about equal to eye, longer than second spine of anal. Longest soft dorsal rays longer than those of anal and somewhat more than snout and eye. Pectorals equal to distance between hindborder of operculum and hindmargin or middle of pupil. Ventrals somewhat shorter. Caudal rounded. Least height of caudal peduncle not much less than its length, less than postorbital part of head. Small teeth forming narrow villiform bands in jaws; in an indistinct double row on vomer. None on palatines. Colour

of alcohol specimens brown. A club-shaped darkbrown band, from hindborder of eye, where it is narrowest, to angle of praeoperculum. An other band from eye to superior angle of operculum. A brownish spot on operculum is not always distinct. Ventrals, second dorsal, anal and caudal brown, narrowly bordered with white. A black ocellus, bordered with white on first dorsal, between fourth and seventh spine. Pectorals with irregular rows of darkish spots. Length 45 mm. [Type in the Zoological Museum of Amsterdam].

Habitat: Nias!; Sumba!; Ambon!; Nusa Laut!; Celebes (Kwandang bay!); Sulu islands!. — In sea.

Note. This species is very near to *A. perdix* (Blkr.), differing only in being less high and in the presence of an ocellus on the membrane of the first dorsal.

35. Apogon perdix (Blkr.)

? *Apogon amblyuropterus* Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 695.
Apogonichthys perdix Bleeker, l.c. VI. 1854, p. 321.
? *Apogonichthys amblyuropterus* Bleeker, Acta Soc. Sc. Indo-Neerl. VI. 1859, Enum. Piscium Arch. Ind. p. 9.
Amia perdix Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 65. — Atl. ichth. VII. 1873—1876, p. 100.
? *Amia amblyuropterus* Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 68. — Atl. ichth. VII. 1873—1876, p. 101.
Apogon perdix M. Weber, Siboga Exp. Fische 1913, p. 230.

D^1 VII; D^2 I. 9; A. II. 8; P. 1.12; V. I. 5; L.l. 23—24; L.tr. $\frac{1\frac{1}{2}}{1}$. $\frac{}{6}$

Dorsal profile arched. Height 2.4—2.7, 3—3.4 in length with caudal. Head 2.2—2.5, 2.7—3.2 in length with caudal. Eye 3.2—3.5. Snout blunt, 1.6 in eye. Interorbital space narrow, twice or a little more than twice in eye. Mouth somewhat oblique, jaws equal. Maxillary reaching to below hindmargin of eye, its height posteriorly twice in eye. None of the bones of the head serrated. Orbital rim rough. First dorsal spine minute, second about half length of third, which is longer and stronger than the others and equal to snout and eye. Spine of second dorsal longer than second one of anal and equal to eye. Longest soft rays of dorsal longer than those of anal, somewhat more than snout and eye.

Pectorals equal to distance between hindborder of operculum and middle of pupil. Ventrals somewhat shorter. Caudal rounded. Teeth small in a rather broad villiform band in upper jaw, a similar but narrower band in lower jaw, in several rows on vomer and absent from palatines. Least height of caudal peduncle not much less than its length, less than postorbital part of head. Colour of preserved specimens light brownish, freckled with numerous small brown spots. A dark brown stripe from eye to upper angle of operculum and to angle of praeoperculum. Fins also freckled with brownish, ventrals dark brown in their distal part. Length 50 mm.

Habitat: Flores; Biaru!; Buru; Ceram!; Nusa Laut!; Sulu-islands!. — In sea.

Note. We examined the single specimen known of *Apogon amblyuropterus*, the type of BLEEKER, in the Leiden Museum. It is in a bad state, the scales being lost and the specimen without any colourmarkings, excepting the caudal, which is indistinctly freckled. In his original description BLEEKER says, that the colour of the specimen had suffered considerably through the preservation in spirit. Not much value can therefore be attached to the description of the coloration and the colour of the figure in the Atlas ichthyologique. We suppose that the species is identical with *A. perdix*, but the type is in too bad a state to make sure.

36. Apogon ellioti Day.

Apogonichthys taeniopterus Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 455. (nec *Apogon taeniopterus* Benn.)
Apogon nigripinnis Günther, Cat. Brit. Mus. I. 1859, p. 235. (nec C.V.).
Amia nigripinnis Bleeker, Ned. Tijdschr. Dierkunde IV. (1871) 1872, p. 137. (nec C.V.)
Amia taeniopterus Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 63. — Atl. ichth. VII. 1876, p. 99 (nec BENN.).
Apogon nigripinnis Günther, Fische der Südsee I. 1873—1875, p. 21. (nec C.V.)
Apogon ellioti Day, Fishes of India 4°, 1875—1878, p. 63; Suppl. p. 784.
Apogon arafurae Günther, Challenger Rep., Zoology I. Shore Fishes 1880, p. 38.
Apogon Ellioti Steindachner & Döderlein, Denkschr. Akad. Wien XLVIII. 1883, p. 2.
Apogon ellioti Day, Proc. Zool. Soc. London 1888, p. 260.
Apogon marginatus Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 896.
Amia marginatus Smith & Pope, Proc. U. S. Nat. Mus. XXXI, 1906, p. 468.

Amia nigripinnis Jordan & Seale, Bull. Bureau Fish. XXV. (1905) 1906, p. 241. (nec C.V.)

Amia marginata Snyder, Proc. U. S. Nat. Mus. vol. 42, 1912, p. 412.

Amia marginata Jordan, Tanaka & Snyder, Journ. Coll. Sci. Univ. Tokyo XXXIII. 1913, p. 139.

Amia ellioti McCulloch, Biol. Results „Endeavour" vol. III. 1915, p. 119.

Amia ellioti Fowler & Bean, Proc. U. S. Nat. Mus. vol. 62, 1922, p. 25.

D^1 VII; D^2 I. 9; A. II. 8; P. 15; V. I. 5; L.l. 25—26; L.tr. 2/6½.

Body elongate. Height 3.2, 3.5 to almost 4 in length with caudal. Head 2.8, 3.2 in length with caudal. Eye 3.5—3.7, equal to interorbital space. Snout one half to two thirds of eye. Mouth very oblique, maxillary extending to a vertical passing between pupil and posterior edge of orbit. Teeth on vomer, palatines and jaws villiform. Vertical border of praeoperculum entire, or very finely serrated on its lower half and outer edge, more distinctly round the angle and on the outer edge of the horizontal border; there may also be a few serrations along the inner angle. First dorsal spine very small, second spine more than half of third. Third, fourth and fifth spine of equal length, somewhat less than snout and eye. Second dorsal much higher than first one, the longest rays one third diameter of eye longer than postorbital part of head. Height of anal between that of first and second dorsal and equal to length of pectorals and of ventrals. Caudal rounded or subtruncate. Scales thin and easily displaced. Colour gray, sides silvery, very faint traces of four or five dark cross shades; top of head, lower jaw, upper portion of operculum and inner margin of praeoperculum with black dots. Upper part of first dorsal black; second dorsal with a marginal and a median black band; anal with a black median band; caudal dusky, with a median and a terminal shade made up of dark points; similar dots on pectorals and ventrals. Young specimens with an indistinct lateral blotch on the tail. Length more than 100 mm. [After DAY and JORDAN & SNYDER, not seen by us].

Habitat: Singapore; Arafura Sea. — East Coast of Africa, Madras, Ceylon, Seas of India, Japan, China, Formosa, Queensland, Banham islands.

37. Apogon poecilopterus C.V. [Fig 80; p. 331].

Apogon poecilopterus (Kuhl & v. Hasselt) Cuvier & Valenciennes, Hist Nat. Poissons II. 1828, p. 114.

Apogon glaga Bleeker, Nat. & Geneesk. Arch. Ned. Indië II. (3) 1845, p. 526. — Verh. Bat. Gen. XXII. (1848) 1849, Percoïden p. 29.

Apogon truncatus Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 415.

Apogonichthys glaga Bleeker, Verh. Bat. Gen. XXVI. 1854—1857, Nieuwe nalez. ichthyol. Japan p. 57.

Amia poecilopterus Bleeker, Nat. Verh. Holl. Maatsch. Wetensch. 3 Verz. II, n° 1, 1874, Révision Apogon. p. 54 (pro parte).

Amia truncata Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 62. — Atl. ichth. VII. 1873—1876, p. 98.

Amia glaga Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 66. — Atl. ichth. VII. 1873—1876, p. 100.

Apogon glaga Day, Fishes of India 4°, 1875—1878, p. 62.

Mionorus glaga Jordan & Seale, Bull. Bureau Fisheries XXVI. (1906) 1907, p. 17.

Apogon bilaciniatus M. Weber, Notes Leiden Mus. XXXI. 1909, p. 161. — Siboga Exp. Fische 1913, p. 235.

D^1 VII; D^2 I. 8—9; A. II. 8 (9); P. 2.14; L.l. 25—26; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{6}$

Oblong. Height 2.6—3, 3—4 in length with caudal. Head 2.4—2.6, 3—3.3 in length with caudal. Eye 3—3.4. Snout two thirds of eye, interorbital space a little more, about three

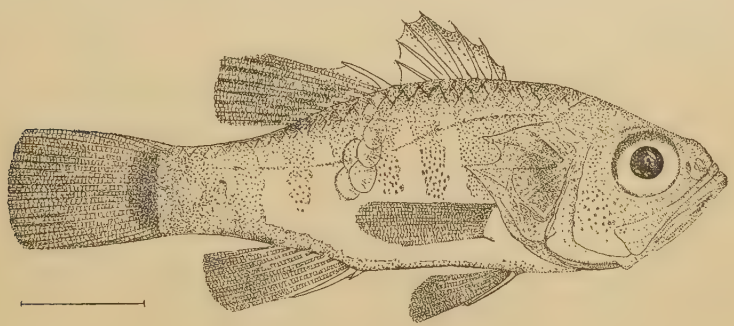

Fig. 80. *Apogon poecilopterus* C. V.

fourths of eye. Lower jaw prominent, with a symphysial knob. Mouth oblique. Maxillary reaching to below hindmargin of eye or not so far. Operculum ending superiorly in two pointed flaps, each with a soft spine, the two spines converging anteriorly. Praeoperculum without serrations but only scalloped at angle, seldom with a few spines. Teeth in anterior third of praemaxilla in one row or in an indistinct double one, caninoid and curved; posteriorly in a villiform band. Teeth of lower jaw caninoid, in one row. Vomer with a few large conical teeth, palatines with one row of pointed, somewhat curved

teeth. Dorsal spines feeble; first spine minute, second more than half of third, which is shorter than fourth. Fourth equal to fifth and almost as long as eye and snout. Second dorsal somewhat higher than anal, and equal to three fourths of height of body. Pectorals longer than ventrals, equal to post-orbital part of head. Caudal very feebly rounded, almost truncate. Scales deciduous, ctenoid, those on head and before dorsal cycloid. Tubes of lateral line swollen at their base. Nine gillrakers, the longest equal to pupil. Colour of alcohol specimens silvery, brownish above. Upper part of first dorsal black between third and fifth spine. Second dorsal and border and terminal third of caudal dusky. Second dorsal sometimes with bluish margaritaceous spots. Other fins hyaline. Length 105 mm. [Types of *A. poecilopterus*, *A. truncatus* and *A. glaga* in the Leiden Museum and of *A. bilaciniatus* in Zoological Museum of Amsterdam seen by us].

Nomen indig.: Glaga (Malay), Siriding (Sundanese), Pemperring (Javanese).

Habitat: Singapore; Banka; Java (Batavia!, Tjilatjap, Cheribon, Samarang, Patjitan); Lombok!; Ambon!. — Madras, Philippines, Japan. In sea.

Note. An examination of the type of *Apogon poecilopterus* C.V. in the Leiden Museum has shown us, that there are not six but seven spines in the first dorsal and that it is identical with *Apogon glaga* Blkr. as well as with *Apogon bilaciniatus* M. Web.

The species described by CANTOR as *A. poecilopterus* is a different species and probably identical with *A. sangiensis*. *Apogon truncatus* known by the type only is nothing else but a specimen of *Apogon poecilopterus*, in which the undulations on the border of the praeoperculum at its angle are more acute and pointed, but the whole margin of the praeoperculum is not serrated and also the praeopercular ridge is smooth.

38. Apogon novae-guineae Val.

Apogon Novae-guineae Valenciennes, Nouv. Ann. Mus. Hist. Nat. 1832, p. 53.
Apogon modestus Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 315.
Apogon Novae Guineae Bleeker, l.c. p. 316.
Apogon novae guineae Günther, Cat. Brit. Mus. I. 1859, p. 237.
Amia Novae Guineae Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon p. 60. — Atl. ichth. VII. 1873—1876, p. 97.

Amia modesta Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon p. 61. — Atl. ichth. VII. 1873—1876, p. 98.
Amia novae-guineae Jordan & Seale, Bull. Bureau Fish. XXVI. (1906) 1907, p. 17.

D^1 VII; D^2 I. 9; A. II. 8; P. 2.12; V. I. 5; L.l. 24—26; L.tr. $\frac{1\frac{1}{2}}{6-7}$.

Height 2.3—2.7, 3—3.4 in length with caudal. Head 2.5—2.6, 3.1—3.2 in length with caudal. Eye 3.3—3.5. Snout equal to interorbital space and about three fourths of eye. Mouth oblique, maxillary reaching almost to below hindborder of eye. Praeoperculum scalloped, with some denticulations at angle. Teeth in narrow bands in jaws, on vomer and none or a few only on palatines. First dorsal spine minute, second one half length of third, which is equal to fourth or fifth spine and longer than eye. Spine of second dorsal equal to second spine of anal and to eye. Ventrals equal to post-orbital part of head, pectorals half diameter of eye longer. Caudal subtruncate, scarcely emarginate. All scales ctenoid. Colour of preserved specimens brownish, silvery below and at sides of head. Upper part of first dorsal dusky. Length 85 mm. [Type of *A. modestus* and specimens of *A. novae-guineae* of BLEEKER's collection seen by us].

Nomen indig.: Glaga (Malay Batavia).

Habitat: Singapore; Java (Batavia!; Anjer!); North Celebes; New Guinea. — Philippines, Norfolk Island. In sea.

Note. We agree with GÜNTHER, that *A. modestus* is a synonym of *A. novae-guineae* after having examined the type in the Leiden Museum.

39. Apogon orbicularis C.V.

Apogon orbicularis Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 155; VI. 1830, p. 495.
Apogon orbicularis Quoy & Gaimard, Voyage Astrolabe, Poissons, 1834, p. 648.
Apogon orbicularis Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 254. — Act. Soc. Sc. Indo-Neerl. I. 1856, Beschrijv. vischfauna Ambon, p. 28.
Apogon nigromaculatus Hombron & Jacquinot, Voyage au Pôle Sud par Dumont d'Urville, Poissons 1853—1854, p. 32.
Amia orbicularis Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 284. — Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1, (1873) 1874, Révision Apogon. p. 19. —Atl. ichth. VII. 1873—1876, p. 79.
Amia nigromaculata Bleeker, Nat. Verh. Holl. Maatsch. Wetensch. 3. Verz. II, n° 1, (1873) 1874, Révision Apogon. p. 20.

Apogon orbicularis Günther, Fische der Südsee I. 1873—1875, p. 22.
Apogon orbicularis Day, Fishes of India 4°, 1875—1878, p. 65.

D^1 VI; D^2 I.9; A. II.8; P. 2.10; V. I.5; L.l. 25—26; L.tr. $\frac{2}{1}\frac{}{(6\frac{1}{2})7}$.

Body much elevated, dorsal profile raising steeply from snout to dorsal. Height 1.8—2, 2.5—2.7 in length with caudal. Head 2.2—2.8, 3.3—3.7 in length with caudal. Eye 2.1—2.8, longer than snout. Mouth oblique, maxillary reaching to below middle of eye in large specimens. Two vertical rows of scales on praeoperculum, which is denticulated along its hind- and lower border. Praeopercular ridge smooth. Villiform teeth in bands in jaws and on palatines and in a V on vomer. Origin of first dorsal somewhat behind that of ventrals; first spine minute, second longest and strongest, at least as long as head without snout. Third one not much shorter but the following ones decreasing rapidly in size, the hindborder of the fin being therefore vertical when the spines are erected. Spine of second dorsal about equal to snout and eye, longest soft rays longer than head without snout. First anal spine minute, second spine long, curved forward, less than head without snout, the first soft rays longer. Pectorals about equal to head without snout. Ventral spines strong, less than eye and snout. Lateral rudimentary rays of caudal more or less spiny. Caudal feebly incised. Least height of caudal peduncle equal to snout and eye. Colour of alcohol specimens reddish brown or yellow. A transverse black band running from origin of first dorsal to belly before anus. A black spot on lateral line at a short distance of base of caudal, which has four similar spots, arranged in a semicircle. Longitudinal rows of scales marked by black spots, more distinct posteriorly and especially large in the middle of the caudal peduncle, where they may fuse into a longitudinal band. Head with black spots. Frontborder of both dorsals, base of second dorsal and hindmargin of ventrals black. First dorsal sometimes with black spots. Length 104 mm. [Specimen of BLEEKER's collection in Amsterdam Museum seen by us].

Habitat: Singapore; Simalur!; Sumatra (Siboga); Nias!; Billiton; Java-sea!; Pulu Kelapa!; Java; Celebes (Menado); Biaru!; Sangir-Islands; Ceram; Ambon; Goram; Waigeu!; New Guinea. — Andamans, Philippines, Hongkong, Caroline Islands, Radick island.

40. Apogon nematopterus Blkr.

Apogon nematopterus Bleeker, Acta Soc. Sc. Indo-Neerl. I. 1856, Beschr. vischfauna Manado, p. 35.

Amia nematopterus Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II, n° 1 (1873) 1874, Révision Apogon. p. 18. — Atl. ichth. VII. 1873—1876. p. 79.

Amia nematophora Bleeker, Atl. ichth. VII. 1873—1876, Tab. CCCXIII. fig. 1.

Apogon nematopterus Macleay, Proc. Linn. Soc. N. S. Wales VII. 1882, p. 236.

D^1 VI; D^2 I.9; A. II. 8—9; P. 2.10; V. I.5; L.l. 25; L.tr. $\frac{1\frac{1}{2}}{1}$. $\frac{}{6\frac{1}{2}}$

Height 1.8, 2.4 in length with caudal. Head 2.4—2.5, 3.2 in length with caudal. Eye 2.5, longer than snout. Mouth oblique reaching to below middle of eye. Praeoperculum denticulated along its hind- and lower border. Praeopercular ridge smooth. Some of the first rays of the soft dorsal are prolonged into long filaments. Colour of alcohol specimens brown, a broad dark band running from base of first dorsal to before vent. Indistinct dark spots on posterior part of body and tail. First dorsal dusky, blackish along its upper border. Ventrals with a faded brownish band. Second dorsal and anal dusky. Length 83 mm. [Type specimens of BLEEKER's collection in Leiden Museum seen by us].

Habitat: Celebes (Menado!). New Guinea.

Note. This species is only a variety of *A. orbicularis*, in which some rays of the soft dorsal are filamentous. The transverse band on the body is broader than in that species. The convexity of the membrane of the first dorsal is not convex as described and figured by BLEEKER, but concave between the spines as in *A. orbicularis*.

41. Apogon trimaculatus C. V.

Apogon trimaculatus Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 156.

Apogon rhodopterus Bleeker, Nat. Tijdschr. Ned. Indië III. (1851) 1852, p. 62.

Apogon koilomatodon Bleeker, l. c. IV. 1853, p. 134.

Amia koilomatodon Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 233. — Nat. Verh. Holl. Maatsch. Wetensch. 3de Verz. II. n° 1, (1873) 1874, Révision Apogon. p. 23. — Atl. ichth. VII. 1873—1876, p. 81.

Amia trimaculata Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 147. — Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1, (1873) 1874, Révision Apogon. p. 21. — Atl. ichth. VII. 1873—1876, p. 80.

Amia rhodopterus Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1, (1873) 1874, Révision Apogon. p. 22. — Atl. ichth. VII. 1873—1876, p. 81.

Apogon trimaculatus Macleay, Descr. Cat. Austr. Fish. I. 1881, p. 46.
Amia koilomatodon, Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 240.
Apogon trimaculatus McCulloch, Proc. Linn. Soc. N. S. Wales XLVI. Prt. 4, 1921, p. 468.

D^1 VI; D^2 I.9; A. II.8; P. 2.12; V. I.5; L.l. 27; L.tr. $\frac{1\frac{1}{2}\ (2)}{1}$ / $\frac{}{6\frac{1}{2}\ (7)}$.

Dorsal profile sloping gently from dorsal to snout. Height 2.4—2.6, 3.2—3.9 in length with caudal. Head 2.5, 3.2—3.3 in length with caudal. Eye 3.3 in head, two thirds of eye-diameter apart, shorter than snout. Mouth oblique, maxillary reaching to below middle of eye. Two vertical rows of scales on praeoperculum, which is denticulated along its hind- and lower border. Praeopercular ridge denticulated. Lower orbital rim with strong denticulations, praeorbital smooth or with a few denticulations posteriorly. Conical teeth in several rows in jaws, in two rows on vomer and palatines. Origin of first dorsal somewhat behind that of ventrals; first spine small, second one much stronger than the others, longer than third one and equal to eye and snout; following spines decreasing rapidly in size, the hindborder of the fin therefore vertical when the spines are erected. Spine of second dorsal equal to third one of first dorsal and to postorbital part of head; longest soft rays almost equal to head without snout. Origin of anal below third soft ray of dorsal. First anal spine minute, second one equal to that of second dorsal. Soft anal rays as long as those of dorsal. Caudal feebly incised, the lobes rounded. Pectorals and ventrals subequal, as long as head without snout or a little shorter. Least height of caudal peduncle almost 1.5 in its length, somewhat more than postorbital part of head. Colour of alcohol specimens reddish brown, lighter below. An indistinct dark brown transverse band from origin of first dorsal to half way ventrals, a second one from end of second dorsal to lateral line, and a dark spot at end of base of anal, a third one on caudal peduncle as well as a small spot in the lateral line at base of caudal may be present. A darkish streak, bordered by lighter, from hindborder of eye to angle of praeoperculum. Dorsals and caudal more or less dusky, other fins hyaline. Length almost 150 mm. [Specimens of *A. koilomatodon* and *A. rhodopterus* of BLEEKER's collection in Leiden Museum seen by us].

Habitat: Singapore; Java (Batavia, Japara); Flores!; Sangir-islands; Ternate; Batjan; Buru; Ambon; New Guinea. — Philippines, Cape York, Queensland, New Hebrides, Shortland island, Solomon islands, Samoa.

42. **Apogon diencaeus** (Smith & Radcliffe).

Amia diencaea Smith & Radcliffe, Proc. U. S. Nat. Mus. vol. 41. 1912, p. 431.

D^1 VI; D^2 I.9; A. II.8; P. 2.12; V. I.5; L.l. 26; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{9}$

Elliptical ovate, caudal peduncle rather long. Height equal to head, 2.5, 3.1 in length with caudal. Eye 2.8, snout three fifths, interorbital space seven tenths of eye. Mouth a little oblique, lower jaw included. Maxillary reaching to below hindmargin of eye. Vertical margin of praeoperculum with a few denticulations; angle, horizontal margin and praeopercular ridge without denticulations. Villiform bands of teeth in jaws. Teeth on vomer and palatines somewhat larger. First dorsal spine minute, second one longest and much stronger than the others, not quite so long as longest soft rays of second dorsal, which are equal to postorbital part of head. Spine of second dorsal slightly longer than that of anal and about equal to eye. Pectorals scarcely shorter than ventrals, half diameter of eye more than postorbital part of head. Caudal incised, the lobes rather pointed. Least height of caudal peduncle 1.6 in its length. All the scales ctenoid. Colour of alcohol specimens cream buff. A dark stripe, very faintly beginning behind operculum, broadening on caudal peduncle and continued on middle caudal rays. A similar dark band, as broad as pupil, from eye to base of pectorals. Fins hyaline. Base of dorsals and anal with some small brown spots. Length 44.5 mm.

Habitat: Nias!; Island Serbete near East-Flores!; Ambon!. — Sulade Island, Jolo, Philippines.

Note. A juvenile specimen of 30 mm. from Nias agrees with the others, but the longitudinal band is only indicated by some melanophores on caudal peduncle and on caudal fin. It is too young to make the determination sure.

43. Apogon dammermani n. sp.

D^1 VI; D^2 I.9; A. II.8; P. 2.11; V. I:5; L.l. 26; L.tr. $\frac{1\frac{1}{2}}{\frac{1}{8}}$.

Oblong, caudal peduncle rather long. Height 2.8, 3.6 in length with caudal. Head 2.7, 3.5 in length with caudal. Eye about 3, somewhat longer than snout. Interorbital space three fourths of eye. Mouth somewhat oblique, jaws equal. Maxillary reaching almost to below hindmargin of eye. Hindborder of praeoperculum serrated, the edge and lower border scalloped. Villiform bands of teeth in jaws; in several rows on vomer, none on palatines. Praeopercular ridge smooth. Orbital rim serrated. First dorsal spine about one third of second, which is longest and strongest and equal to snout and eye; longest soft rays of second dorsal somewhat longer. Spine of second dorsal scarcely longer than that of anal, equal to eye. Pectorals a little longer than head without snout, ventrals half diameter of eye longer than postorbital part of head. Caudal rounded. Least height of caudal peduncle 1.6 in its length, equal to postorbital part of head. Colour of alcohol specimen uniform brown, fins hyaline with small spots on rays. Length of single specimen 91 mm. [Type of species in Zoological Museum of Amsterdam].

Habitat: North New Guinea. In sea.

Named for Dr. K. W. DAMMERMAN, director of the Zoological Museum, Buitenzorg, from where we received the specimen.

This species seems to be allied to *A. tickelli* Day, from Akyab, but differs in having one scale less above the lateral line and in wanting the black spot at root of caudal.

44. Apogon ceramensis Blkr.

Apogon ceramensis Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 256.
Amia ceramensis Bleeker, Verh. Holl. Maatsch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 45. — Atl. ichth. VII. 1873—1876, p. 91.
Apogon ceramensis Day, Fishes of India 4°, 1875—1878, p. 65.
Apogon ceramensis Steindachner, Abh. Senckenberg. Ges. XXV. 2. Heft, 1901, p. 416.
Amia lateralis Jordan & Seale, Bull. Bur. Fisheries XXV. (1905) 1906, p. 246 (nec VAL.).
Amia lateralis Jordan & Richardson, l.c. (1907) 1908, p. 254 (nec VAL.).
Amia ceramensis Seale, Philip. Journ. Science v. n° 4, 1910, p. 274.
Apogon ceramensis M. Weber, Siboga Exp. Fische 1913, p. 228.

D^1 VI; D^2 I. 9; A. II. 8; P. 2.11—12; V. I. 5; L.l. 24—25; L.tr. $\frac{1\frac{1}{2}}{1}$ / $\frac{}{6\frac{1}{2}—7}$.

Dorsal profile somewhat arched, with a slight convexity at nape. Height 2.3—2.4, 3—3.3 in length with caudal. Head 2.5—2.8, 3.3—3.5 in length with caudal. Eye 3.1—3.5. Snout about equal to interorbital space and slightly less than eye. Mouth oblique, jaws equal. Maxillary reaching to below hindborder of pupil, its height posteriorly twice in eye. Hind and lower border of praeoperculum serrated. Praeopercular ridge, praeorbital and orbital rim smooth. First dorsal spine one third or less than one third of second spine, which is longer, but scarcely stronger than third one and equal to distance between hindmargin of operculum and hindborder of pupil. Spine of second dorsal equal to postorbital part of head, second spine of anal scarcely more than eye. Longest soft rays of dorsal longer than those of anal, equal to pectorals and to snout and eye together or somewhat longer. Ventrals somewhat shorter. Caudal incised, the lobes somewhat pointed. Least height of caudal peduncle 1.3 in its length, about equal to postorbital part of head. Teeth small, in bands in jaws, in a double or triple row on vomer and in a double row on palatines. Colour of alcohol specimens yellowish, silvery on sides of head and belly. Snout darkish. One or more spots or stripes, diverging from eye on postorbital part of head. A black stripe from operculum to base of caudal, ending in a small spot on lateral line. A black blotch behind operculum and above this line often present, sometimes connected with the stripe or represented by a short vertical stripe or absent. An indistinct dark stripe on median ventral line of caudal peduncle. Anterior border of first dorsal blackish. Second dorsal and anal often with a subbasal dark, narrow band. Upper and lower caudal rays sometimes darkish. Other fins hyaline. Length almost 100 mm.

Habitat: Singapore; Sumatra (Siboga); Bawean; Pulu Kelapa!; Borneo (Kota Baru!, Sandakan); Celebes (Badjoa); Buru; Ceram; Ambon!; Kangeang islands!; Sumbawa!; Timor!; Kei islands!; Ternate; Waigeu!; Mysore; New Guinea. — Nikobars, Philippines, Caroline, Fiji and Marshall islands. In sea and brackish water.

Note. This species is hardly distinguishable from *A. amboinensis*, except when the specimens show the typical colour pattern, but many specimens, where only the caudal blotch and the median stripe are present, are almost impossible to identify. There is no difference in the number of pectoral rays, as BLEEKER believed. The second dorsal spine is generally stronger in *A. amboinensis*, but the difference is very slight.

45. Apogon amboinensis Blkr.

Apogon amboinensis Bleeker, Nat. Tijdschr. Ned. Indië XV. 1858, p. 223.
Amia amboinensis Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 44. — Atl. ichth. VII. 1873—1876, p. 90.
Apogon Amboinensis Macleay, Proc. Linn. Soc. New S. Wales VII. 1882, p. 236.
? *Amia amboinensis* Seale, Occas. Papers B. P. Bish. Mus. Hawaii, IV. 1906, p. 32.
? *Amia lateralis* Snyder, Proc. U. S. Nat. Mus. vol. 42, 1912, p. 497 (nec C.V.).
Apogon amboinensis de Beaufort, Bijdr. tot de Dierkunde Afl. 19, 1913, p. 115.
Apogon amboinensis M. Weber & de Beaufort, Nova Caledonia, Zool. II. Livr. 1, N°. 2, 1915, p. 32.

D^1 VI; D^2 I. 9; A. II. 8; P. 2.12; V. I. 5; L.l. 24—25; L.tr. $\frac{1\frac{1}{2}}{6\frac{1}{2}}$.

Dorsal profile rather arched, with a slight concavity at nape. Height 2.2—2.9, 3.1—3.3 in length with caudal. Head 2.2—2.5, 2.9—3.2 in length with caudal. Eye 3.1—3.5. Snout about equal to interorbital space and less than eye. Mouth a little oblique, jaws equal. Maxillary reaching to below hindborder of pupil, its height posteriorly almost 2.5 in eye. Hind- and lower border of praeoperculum serrated. Praeopercular ridge, praeorbital and orbital rim smooth. First dorsal spine less than one half of second spine, which is about equal to third in length, but conspicuously thicker than the other spines and as long as distance between hindmargin of operculum and hindborder of pupil. Spine of second dorsal somewhat longer than that of anal and equal to postorbital part of head. Longest rays of soft dorsal longer than those of anal and about equal to distance between hindmargin of operculum and middle of pupil or a little shorter. Pectorals a little shorter than head without snout, and longer than ventrals. Caudal incised, the lobes somewhat pointed. Least height of caudal peduncle 1.5 in its length, slightly less than postorbital part of head. Teeth in bands of about four rows in jaws; in a double row on vomer and an incomplete double row on palatines. Colour of preserved specimens yellowish, silvery on

sides of head and belly. Two black stripes, diverging from eye, on lower part of cheeks. A black stripe from snout through eye to base of caudal, where it ends in a round black patch. A similar stripe on body, following course of lateral line and another one along median ventral line of caudal peduncle. These stripes are often faded. Anterior border of first dorsal blackish. Second dorsal and anal sometimes with a subbasal longitudinal darkish band. Other fins hyaline. Length almost 100 mm.

Habitat: Singapore; Simalur!; Nias!; Billiton; Java (Batavia); Bawean; Buru!; Ceram; Ambon; Goram; Aru islands!; Waigeu!; New Guinea. — Coast of Zanzibar, Riu Kiu islands?, Japan?, Solomon islands?, New Caledonia!. In sea, entering fresh water.

46. Apogon hyalosoma Blkr.

? *Apogon thermalis* Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 492.
Apogon thermalis Bleeker, Nat. en Geneesk. Arch. Ned. Indië II 1845, p. 526. — Journ. Ind. Arch. II. 1848, p. 635. — Verh. Bat. Gen. XXII. 1849, Percoïden, p. 27.
Apogon hyalosoma Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 63; l. c. V. 1853, p. 329.
Apogon hyalosoma Günther, Cat. Brit. Mus. I. 1859, p. 231.
Apogon hyalosoma Kner, Novara Exp. Fische 1865—1867, p. 42.
Apogon hyalosoma Peters, Monatsber. Akad. Wiss. Berlin (1868) 1869, p. 256.
Amia hyalosoma Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 57. — Atl. ichth. VII. 1873—1876, p. 96.
Apogon hyalosoma Day, Fishes of India 4°, 1875—1878, p. 64.
Apogon hyalosoma Macleay, Descr. Cat. Austr. Fish. I. 1881, p. 45.
Apogon hyalosoma Perugia, Ann. Mus. Civ. Genova (2) XIII (XXXIII) 1893, p. 252.
Apogon hyalosoma Jatzow & Lenz, Abh. Senckenb. Naturf. Ges. XXI. 1899, p. 499.
Amia hyalosoma Seale, Philip. Journ. of Science V. n° 4, 1910, p. 274.
Apogon hyalosoma Hora, Mem. Asiat. Soc. Bengal VI. 1924, p. 485.

D^1 VI; D^2 I.9; A. II.8; P. 2.12; L.l. 24—26; L.tr. $\frac{2—2\frac{1}{2}}{1}$ $\frac{}{7—8}$.

Dorsal profile arched, with a marked concavity at nape. Height 2.3—2.6, 2.9—3.4 in length with caudal. Head 2.3—2.4, 2.9—3.2 in length with caudal. Eye 3.2—4.2 according to size. Snout longer than eye in large specimens, equal to eye or even a little shorter than eye in small specimens. Interorbital space about three fourths of eye. Mouth oblique, lower jaw and especially chin, somewhat prominent. Maxillary reaching almost to below hindborder of eye, or not so far, its height

posteriorly 1.5 in eye. Hind and lower border of praeoperculum feebly serrated, sometimes almost obsolete; serrations on the edge generally stronger but in old specimens they also may be very indistinct. Praeopercular ridge, praeorbital and orbital rim smooth. First dorsal spine one third or less than one third of second, which is stronger or much stronger than the others and somewhat less than eye and snout. Spine of second dorsal equal to third or to fourth spine of first dorsal and equal to snout and half diameter of eye together. Second anal spine somewhat shorter, equal to snout or a little longer than snout. Longest rays of soft dorsal somewhat longer than those of anal, equal to snout and eye and as long as pectorals, which are scarcely shorter than ventrals. Caudal incised. Least height of caudal peduncle 1.2 or less in its length, about equal to postorbital part of head. Teeth small in jaws, in rather broad villiform bands; on vomer in several rows and in an indistinct double row on palatines. Colour of preserved specimens yellowish or brownish, lighter below. A large round black blotch near base of caudal, on lateral line. A black spot or stripe at end of base of anal; a similar spot often also at end of base of second dorsal. Sometimes both continued along the base of the whole fin and also along that of first dorsal. A blackish spot on operculum may be present. Fin-membrane between second and third spine of dorsal blackish, sometimes only distinct in superior and inferior part of the membrane or only forming a black spot superiorly. Second dorsal and anal often somewhat dusky, especially anteriorly. Caudal slightly dusky. Ventrals and pectorals hyaline or with a dusky hew. Length 170 mm. [Specimen of BLEEKER's collection in the Museum of Amsterdam seen by us].

Nomen indig.: Glaga.

Habitat: Singapore; Simalur!; Sumatra (Benkulen, Trussan, Padang, Priaman, Siboga); Nias!; Engano; Billiton; Java (Batavia, Samarang); Borneo (Sandakan); Sumbawa; Celebes (Makassar!, Menado); Ambon!; Aru islands!; New Guinea (Humboldt bay!). — Zanzibar, Seychelles, Coasts of British India, Siam, Philippines, Port Darwin, Island Puynipet. In sea and fresh water.

47. Apogon sangiensis Blkr.

Apogon poecilopterus? Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 984 (nec C.V.).
Apogon sangiensis Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 375.
Amia sangiensis Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 56. — Atl. ichth. VII. 1873—1876, p. 95.
Apogon sangiensis Günther, Fische der Südsee I. 1873—1875, p. 20.
Apogon sangiensis Day, Fishes of India 4°, 1875—1878, p. 64.
Apogon sangiensis Macleay, Proc. Linn. Soc. N. S. Wales VII. 1882, p. 235.
Apogon sangiensis de Beaufort, Bijdragen tot de Dierkunde, Afl. 19, 1913, p. 114.

D^1 VI; D^2 I.9; A. II.8; P. 2.11; V. I.5; L.l. 25; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\frac{}{6\frac{1}{2}}$

Dorsal and ventral profile evenly convex, dorsal profile from snout to dorsal almost straight. Height 2.5—2.7, 3.3—3.5 in length with caudal. Head 2.4—2.5, 3—3.3 in length with caudal. Eye 3—3.5. Snout equal to or somewhat more than interorbital space and about five sixths of eye. Mouth somewhat oblique, jaws equal. Maxillary reaching to below middle of eye, its height posteriorly about 2.5 in eye. Hind- and lower border of praeoperculum serrated. Praeopercular ridge, praeorbital and orbital rim smooth. First dorsal spine much less than one half of second, which is somewhat stronger than the following ones and equal to distance between hindmargin of operculum to hindborder of pupil. The third and fourth spine are prolonged into a filament, the third being the longest and exceeding the second by as much as width of pupil. This filamentous prolongation however is not present in all the specimens examined. Spine of second dorsal about equal to fourth spine of first dorsal and equal to eye, somewhat longer than eye in small specimens. Anal spine somewhat shorter. Longest soft rays of dorsal longer than those of anal and as long as second dorsal spine and as ventrals. Pectorals as long as third dorsal spine. Caudal incised. Least height of caudal peduncle 1.2—1.3 in its length and about equal to postorbital part of head. Several rows of small teeth forming villiform bands in the jaws, those on vomer somewhat larger in an indistinct double row. Teeth on palatines in a single row. Colour of alcohol specimens yellowish, with silvery reflections on sides of head and belly. A black band from snout through eye to hindmargin of operculum. A black spot at base of caudal on lateral line; a small black spot at origin of first

dorsal and at origin and end of second dorsal. Frontborder of first dorsal, including the filamentous part, black. Second dorsal, anal and often also caudal with several transverse narrow dusky bands, the interspaces with a row of more or less distinct milky white spots. In some specimens these bands and spots are absent. Pectorals and ventrals yellowish. Length 84 mm. [Type in the Leiden Museum seen by us].

Habitat: Singapore; Pulu Weh!; Nias!; Pulu Kelapa!; Sangir islands; Waigeu!; New Guinea. — Durban, Andamans, New Hebrides, Yap. In sea and brackish water.

Note. The specimens mentioned by EVERMANN & SEALE (Bull. Bureau Fisheries XXVI. (1906) 1907, p. 72) from the Philippines have D^1 VII and probably do not belong to this species. We now think that the specimens mentioned by one of us (M. WEBER, Siboga Exp. Fische 1913, p. 229) from Binongka as possibly belonging to *A. sangiensis* are of an other species, but the specimens are too small to identify them with certainty.

48. **Apogon leptacanthus** Blkr.

Apogon leptacanthus Bleeker, Nat. Tijdschr. Ned. Indië XII. 1856, p. 204.
Amia leptacanthus Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 59. — Atl. ichth. VII. 1873—1876, p. 97.
Apogon leptacanthus Macleay, Proc. Linn. Soc. N. S. Wales, 1882, p. 235.

D^1 VI; D^2 I,9; A. II.9.; P. 2.11; V. I.5; L.l. 24—25; L.tr. $\frac{1\frac{1}{2}}{1}$.
$\overline{6\frac{1}{2}}$

Dorsal profile evenly rounded. Height 2.4—2.7, 3—3.3 in length with caudal. Head 2.5—2.6, 3.2—3.3 in length with caudal. Eye 2.4—2.6. Snout somewhat less than interorbital space and 1.4—1.7 in eye. Mouth oblique, lower jaw somewhat prominent. Maxillary reaching almost to below middle of eye, its height posteriorly about 2.8 in eye. Lower border of praeoperculum serrated, hindborder only indistinctly so. Praeopercular ridge, praeorbital and orbital rim smooth. First dorsal spine about half length of third without its filament. Second spine slender, produced into a filament, which is often broken in preserved specimens. It is generally much longer than head and may even reach to base of caudal, when laid down. Spine of second dorsal not much longer than anal and

than eye. Anterior rays of soft dorsal longer than the others and as long as those of anal, which are equal to eye and snout. Pectorals as long as head without snout. Ventrals shorter than eye and snout. Caudal feebly incised. Least height of caudal peduncle about 1.3 in its length and equal to post-orbital part of head. Teeth small in a few rows in jaws, in one row on vomer, indistinct on palatines. Colour of preserved specimens yellowish. Head and body covered with small melanophores, somewhat larger and more crowded on some places and then forming a spot on lateral line at base of caudal and a dark line along dorsal and ventral median line of caudal peduncle and along base of vertical fins. First dorsal blackish in its antero-superior part, the filament of the second spine black. Others fins hyaline. Length 56 mm.

Habitat: Pulu Weh!; Nias!; Ternate; New Guinea.

Note. We have examined numerous specimens from Pulu Weh, where this species seems to be very common. Among our material are two specimens with the mouth filled with eggs.

This species is closely allied to *A. sangiensis*, but differs by its larger eye, more oblique mouth and by having constantly one soft ray more in the anal.

49. **Apogon buroënsis** Blkr.

Apogon buroënsis Bleeker, Nat. Tijdschr. Ned. Indië XI. 1856, p. 394.
Amia buroënsis Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. no 1 (1873) 1874, Révision Apogon. p. 70. — Atl. ichth. VII. 1873—1876, p. 102.
Apogon buruensis Macleay, Proc. Linn. Soc. New S. Wales VIII. 1883, p. 255.

D^1 VI; D^2 I. 9; A. II. 13—14; P. 2. 12; V. I. 5; L.l. 25—26; L.tr. $\frac{2}{1}$.
7

Compressed, oblong. Height 2.6—3, 3.4—4 in length with caudal. Head 2.4, 3.2 in length with caudal. Eye 3.3—4. Snout four fifths of eye. Interorbital space a little less than eye. Mouth much oblique. Jaws equal. Maxillary reaching to below hindmargin of pupil. Teeth small in bands on jaws and vomer, and in narrow bands on palatines. Praeoperculum coarsely serrated, its ridge as well as other bones of the head smooth. First dorsal spine two thirds of second spine, which is about equal to fourth; lastnamed spine is equal to spine

of second dorsal and to second anal spine, which are equal to snout and half eye. Anterior soft rays of dorsal and anal longer than the posterior ones, those of dorsal somewhat longer than those of anal and almost equal to head without snout and to pectorals, which reach on anal. Ventrals much shorter, somewhat longer than snout and eye. Caudal incised with rather pointed lobes. Least height of caudal peduncle about 1.5 in its length, less than postorbital part of head. Colour of alcohol specimens yellowish. A dark narrow band from snout through eye to middle of base of caudal, where it ends into a round black blotch. A similar band running from snout above eye, below dorsal and ending about below end of second dorsal. A third band along base of anal and uniting with that of the other side behind that fin, where it is continued as a median band along lower side of caudal peduncle. Fins somewhat dusky. Length 97 mm.

Habitat: Simalur!; Buru!; New Guinea. In sea and brackish water.

50. Apogon zosterophorus Blkr.

Apogon zosterophorus Bleeker, Act. Soc. Indo-Neerl. I. 1856, Beschr. vischfauna Manado p. 36.

Amia zosterophora Bleeker, Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 71. — Atl. ichth. VII. 1873—1876, p. 103.

Apogon zosterophorus Macleay, Proc. Linn. Soc. N. S. Wales VII. 1882, p. 235.

Archamia zosterophora M. Weber, Siboga Exp. Fische 1913, p. 236.

Archamia zosterophora Fowler, Proc. Acad. Nat. Sci. Philadelphia LXX. 1918, p. 28.

D^1 VI; D^2 I.8—9; A. II.15—16; P. 2.10—11; L.l. 25; L.tr. $\frac{1\frac{1}{2}}{7\frac{1}{2}}$.

Compressed, head blunt, its height about equal to its length. Height 2.4, 3.1—3.2 in length with caudal. Head 2.3—2.5, 3—3.3 in length with caudal. Eye 2.8—3. Snout about two thirds of eye, a little less than interorbital space. Mouth oblique. Maxillary reaching to below middle of eye. Jaws equal. Teeth in a few rows in jaws; some teeth on vomer and on anterior part of palatines. Praeoperculum serrated, especially along the edge and the lower border, where the serrations are coarser. None of the other bones of the head serrated. First dorsal spine about half length of second, which is equal to second anal spine and somewhat shorter than third dorsal spine; last-named is the longest and is equal to spine of second dorsal

and to postorbital part of head. Anterior soft rays of dorsal and anal longer than the posterior ones, subequal and about as long as eye and snout. Pectorals as long as head without snout. Ventrals shorter, equal to snout and eye. Caudal incised. Colour of preserved specimens yellowish, sides of head and body silvery. Head and body covered with small black spots (melanophores). A black spot at base of caudal. A broad band, consisting of numerous bluish glittering spots (iridocysts), surrounded by radiating black lines, running from base of second dorsal obliquely downwards and forwards to belly between first anal rays and base of ventrals and the space between it and isthmus. It is as broad as base of second dorsal. Similar iridocysts on hindborder of operculum. A dark brown band from snout to eye. Second dorsal with some black spots, other fins hyaline. Length 65 mm.

Habitat: Celebes (Menado); Ternate; Kei-islands!; New Guinea. — Philippines.

Note. This species is hardly more than a race of *A. lineolatus*, perhaps differing in having half a scale less above lateral line. The transverse band is very characteristic, but the band from snout to eye is sometimes present in *A. lineolatus*. In the specimens of *A. lineolatus* which show this band we find also some iridocysts between ventrals and isthmus, as in *A. zosterophorus*, but any trace of the broad band on the body is wanting.

51. Apogon lineolatus C. V.

Apogon lineolatus Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 160.
Apogon macropterus Cuvier & Valenciennes, ibidem.
Apogon lineolatus Rüppell, Atlas Reise N. Afrika, Fische 1828, p. 47. — Neue Wirbelthiere, Fische 1837, p. 85.
Apogon zeylonicus Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 491.
Apogon argenteus Valenciennes, Nouv. Arch. Museum 1832, p. 60.
Apogon fucatus Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 986.
Apogon macropterus Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 168.
Apogon macropteroides Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 724.
Apogon bleekeri Günther, Cat. Brit. Mus. I. 1859, p. 245.
Apogon notata Day, Proc. Zool. Soc. London 1867, p. 936 (nec Houttuyn).
Apogon lineolatus Klunzinger, Abh. zool. bot. Ges. Wien XX. 1870, p. 710.
Amia macropterus Bleeker, Verh. Holl. Maatsch. Wetensch. 3de Verz. II n° 1 (1873) 1874, Révision Apogon. p. 72. — Atl. ichth. VII. 1873—1876, p. 103.
Apogon macropterus Day, Fishes of India 4°, 1875—1878, p. 64.
Apogon (Archamia) macropterus Steindachner & Döderlein, Denkschr. Akad. Wien XLVIII. 1883, p. 3.

Apogon macropterus Macleay, Proc. Linn. Soc. N. S. Wales VIII. 1883, p. 255.
Apogon lineolatus Klunzinger, Fische des Rothen Meeres I. 1884, p. 19.
Apogon lineolatus Day, Fauna British India, Fishes, vol. I. 1889, p. 499.
Apogon macropterus Sauvage, Poissons de Madagascar, 1891, p. 141.
Archamia kagoshimana Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 907.
Archamia bleekeri Fowler, Journ. Acad. Nat. Sci. Philad. (2) XII. Prt. 4, 1904, p. 519 (name only).
Archamia lineolata Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 252.
Archamia lineolata Jordan & Seale, l.c. XXVI. (1906) 1907, p. 17.
Archamia macropteroides Evermann & Seale, ibid. p. 74.
Apogon macropterus Pellegrin, Bull. Mus. Hist. Nat. XIII. 1907, p. 204.
Archamia lineolata M. Weber, Siboga Exp. Fische, 1913, p. 236.

D^1 VI; D^2 I. 9; A. II. 13—17; P. 2.12; V. I. 5; L.l. 25—27; L.tr. $\frac{2}{1}$. $\frac{}{7\frac{1}{2}}$.

Compressed, head blunt, its height about equal to its length. Height 2.4—2.6, 3—3.3 in length with caudal. Head 2.4—2.7, 3.1—3.5 in length with caudal. Eye 2.5—2.9. Snout about two thirds of eye, a little less than interorbital space. Mouth oblique. Maxillary reaching to below middle of eye. Jaws equal. Teeth in a few rows in jaws, some teeth on vomer and a single row in anterior part of palatines. Praeoperculum serrated, especially along the edge and the lower border, where the serrations are coarser. None of the other bones of the head serrated. First dorsal spine about one third or one half of second, which is equal to second anal spine and somewhat shorter than third dorsal spine; this spine is the longest and is equal to spine of second dorsal and to postorbital part of head. Anterior soft rays of dorsal and anal longer than the posterior ones, subequal and about as long as eye and snout. Pectorals as long as head without snout. Ventrals shorter, equal to snout and eye. Caudal incised. Colour of preserved specimens yellowish or brownish, more or less silvery on sides of head. Head and body more or less densely covered by small black spots (melanophores), which sometimes are arranged in regular rows and are more crowded on caudal peduncle at base of caudal, where they form a more or less developed spot or patch. In some specimens a number of narrow oblique transverse darkbrown bands, corresponding with the rows of scales, are visible. Head sometimes marked with a blackish band from snout to eye, sometimes a black spot above operculum and a dark vertical streak from eye downwards. Length

100 mm. [Specimens of *A. macropterus* of BLEEKER's collection in the Zoological Museum of Amsterdam seen by us].

Nomen indig.: Glaga (Malay Batavia).

Habitat: Pulu Weh!; Singapore; Sumatra (Padang); Nias!; Banka; Lepar; Java (Batavia!); Java-sea!; Bawean; Bali; Lombok!; Celebes (Bonthain, Badjoa, Menado); Saleyer!; Buton!; Biaru; Salibabu!; Ternate; Halmahera; Batjan; Ceram!; Ambon; New Guinea. — From Madagascar, East coast of Africa, Red Sea, coast of British India, Ceylon, Penang, Japan, Formosa, Philippines, New Hebrides!, Dunk island, Samoa, Vanicola. — In sea.

Doubtful species.

The following species are only known from descriptions, made by BLEEKER after drawings by CASTELNAU. As in no case fin-formulae, number of scales or other structural characters are known, their systematic position remains doubtful.

1. Apogon melanurus Blkr.

Apogon melanurus Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 454.
Amia melanurus Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 28. — Atl. ichth. VII. 1873—1876, p. 83.

Height more than 4 in total length. Head pointed. Caudal much emarginate; caudal lobes acutely rounded. Colour violaceous above, violaceous green below. Body with 7 longitudinal rows of small purple-violaceous spots. Dorsal and ventral spines violaceous, other fins red. Caudal with a broad transverse semilunar black band, with the convexity directed anteriorly. Anal broadly bordered with black.

Habitat: Singapore.

2. Apogon singapurensis Blkr.

Apogon singapurensis Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 454.
Amia singapurensis Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II n° 1 (1873) 1874, Révision Apogon. p. 28. — Atl. ichth. VII. 1873—1876, p. 83.

Height more than 3 in total length. Head somewhat pointed. Caudal lobes pointed. First dorsal high, not or scarcely lower than second dorsal. Colour pink. A round black spot on tail. Four golden bands from head to caudal. First dorsal white, other fins red.

Habitat: Singapore.

3. Apogon arenatus Blkr.

Apogon arenatus Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 455.
Amia arenata Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II, n° 1 (1873) 1874, Révision Apogon. p. 47. — Atl. ichth. VII. 1873—1876, p. 92.

Height more than 3 in total length. Rostro-dorsal profile convex; mouth very oblique. Caudal deeply incised, its lobes pointed. Body hyaline, somewhat pink above. Head and body superiorly and at the sides covered with small but very distinct red points. Fins pink.

Habitat: Singapore.

4. Apogon macrophthalmus (Blkr.)

Apogonichthys macrophthalmus Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 455.
Amia macrophthalmus Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 63. — Atl. ichth. VII. 1873—1876, p. 99.

Height more than 3 in total length. Head obtuse. Eye 2 or less than 2. Second dorsal, anal and caudal convex. Colour violaceous-pink above, lighter below. Body with 5 or 6 longitudinal carmine coloured bands of unequal width. Fins beautifully carmine coloured.

Habitat: Singapore.

Doubtful genus and species.

Apogonoides Blkr.

Bleeker, Journ. Ind. Arch. III. 1849, p. 71.

Bleeker described this genus as follows: „Dentes maxillares setacei, palatini et vomerini nulli. Ossa opercularia non dentata, operculo spina nulla. Os parum protractile. Pinnae dorsi 2 distantes, non squamatae. Membrana branchiostega radiis 6."

The description of the only species *A. macassariensis* Blkr. (l. c.) runs:

„Ap. corpore oblongo compresso altitudine $4\frac{1}{2}$ circiter in ejus longitudine, capite 4 in corporis longitudine, pinna caudali biloba.

B. 6, D. 6—1.9, P. 11, V. 1.5, A. 2—11, C. 16.

Habitat: Macassar. Mare.

Species habitu *Apogon glaga* Blkr. affinis. Specimina mihi 7 minus bene conservata colores nec viscera monstrant."

Jordan, Genera of Fishes, Part II. 1919, p. 240 remarks: „This forgotten genus is based on a species without teeth on

the palate; with the preopercle entire, no opercular spines: D. VI—I, 9; caudal bilobed. *Apogonoïdes* seems to differ from the later *Apogonichthys* only in the presence of 6, not 7, dorsal spines and the bilobed caudal."

Curiously enough, BLEEKER never again mentioned this species.

2. Oxyodon Brauer [Fig 81, p. 351] [1]).

(BRAUER, Tiefseefische „Valdivia" 1906, p. 287).

Body compressed, covered with rather large ctenoid scales, head totally scaly, lateral line complete, continued on caudal. Eyes large. Mouth large, protractile; maxillary excluded from gape of mouth. Teeth small, equal and pointed, uniserial in jaws; similar teeth on vomer and palatines. Praeoperculum with a double edge, both entire; operculum with three to four short spines near its flap. Gillrakers very long. First dorsal with seven to eight spines, the second with one spine; anal with two spines and eight to nine branched rays; ventrals with one spine; all spines entire; caudal forked, partly scaly. Vent nearer to anal than to ventrals.

Distribution: as that of the single species known.

1. Oxyodon macrops Brauer.

Oxyodon macrops Brauer, Tiefseefische „Valdivia" 1906, p. 288.

D^1 VII—VIII; D^2 I.10; A. II.8—9; P. 16; V. I.5; L.l. 52—55; L.tr. $\frac{2}{\frac{1}{9—10}}$.

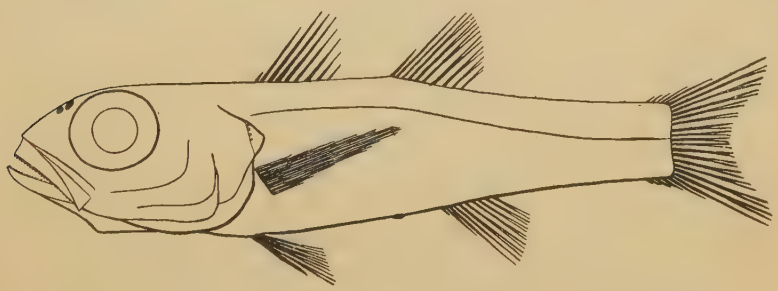

Fig. 81. *Oxyodon macrops* Brauer. After BRAUER.

Height 4.4, head 2.7 in length without caudal. Snout 4.2 in

1) See note by *Acropoma* on pag. 368.

head; lower jaw somewhat prominent. Mouth oblique, reaching vertical through anterior border of pupil. Eye 2.9 in head, somewhat more than interorbital space. Second dorsal separated from first nearly by the length of the snout. Origin of anal below middle of second dorsal. Ventrals not reaching to vent; pectorals about 2/3 of length of head. Colour yellowish, densely covered with black points; branchiostegal membrane, lower surface of head black; points of caudal blackish. Length 212 mm. [After BRAUER, not seen by us].

Habitat: West coast of Sumatra in 900 m. depth.

3. **Foa** Jordan & Evermann.

(JORDAN & EVERMANN, Bull. U. S. Fish. Commission XXIII (1903) 1905, p. 210).

Scales moderate, ctenoid, those of head sometimes cycloid. Lateral line incomplete, reaching from head to below origin

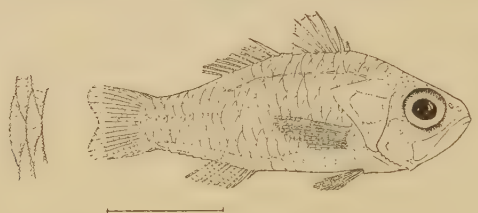

Fig. 82. *Foa fistulosa* M. Web. $1^1/_2$.

of second dorsal. Small teeth in bands in jaws and on vomer, present or wanting on palatines. No canini. Praeoperculum smooth or with the free border serrated. Caudal rounded or truncate. First dorsal with seven spines, anal with seven to eight soft rays. Gillrakers short, not numerous.

Distribution: Indo-australian Archipelago and Pacific islands. Small shore fishes.

Note. This genus differs only from *Apogon* by the incomplete lateral line and is connected to it by such species as *Apogon auritus*, *perdix* and *ocellatus*.. Its validity is problematic.

Key to the indo-australian species of Foa.

I. Silvery subcutaneous tubes on tail . . . . . 1. *F. fistulosa* p. 353.

II. No silvery subcutaneous tubes.

A. Height 2—2.7. Dorsal profile of head concave . 2. *F. hyalina* p. 353.

B. Height 2.6—3. Dorsal profile of head somewhat arched.

a. Pectorals almost as long as head. Pectorals darkbrown. Caudal hyaline. . . . . 3. *F. longimana* p. 354.

b. Pectorals as long as postorbital part of head and half diameter of eye together. Pectorals hyaline. Caudal with irregular transverse bars. 4. *F. vaiulae* p. 355.

1. **Foa fistulosa** M. Web. [Fig. 82, p. 352].

Foa fistulosa M. Weber, Notes Leyden Mus. XXXI. 1909, p. 162. — Siboga Exp. Fische 1913, p. 237.

D^{1} VII; D^{2} I.9; A. II.8; P. 13; L.l. 23; L.tr. $\frac{1}{5\frac{1}{2}}$.

Height 2.8, equal to length of head. Eye 3. Snout two thirds of eye. Lower jaw prominent. Maxillary reaching to below hindborder of pupil. Mouth very oblique. Praeoperculum finely serrated along the inferior third of its hindmargin and with coarser serrations along its lower border. Scales ctenoid, those of sides very high and narrow and with radiating longitudinal striae. Few large silvery cycloid scales on cheeks and opercles. Lateral line incomplete, only the first eleven to thirteen scales have a tube, the following with a pit at most. Small equal teeth in the jaws, vomer and palatines. Longest dorsal spine somewhat more than eye. Caudal probably emarginate. Nine slender gillrakers, the longest about two thirds of eyediameter. Cheeks, opercles and sides of body silvery, gradually merging into the yellow colour of back. At height of anus at each side a silvery subcutaneous tube is visible, which is continued along base of anal and ends tapering at base of caudal. Length 35 mm. [Type in the Zoological Museum of Amsterdam].

Habitat: Sumbawa!. — In sea.

2. **Foa hyalina** (Smith & Radcliffe).

Amia hyalina Smith & Radcliffe, Proc. U. S. Nat. Mus. vol. 41, 1912, p. 433.

D^{1} VII; D^{2} I.9; A. II.8; L.l. 21; L. tr. $\frac{2}{1}$.
$\frac{}{6}$

General form ovate, compressed. Dorsal profile of head concave. Height 2.27, head 2.6. Eye 3.5. Snout nearly as long as eye. Interorbital space seven eighths of eye. Mouth somewhat oblique, upper jaw slightly longer, more or less overlapping the lower; maxillary reaching vertical from posterior margin

of eye. Praeoperculum smooth. Broad bands of villiform teeth on jaws, vomer and palatines. Scales ctenoid. Lateral line incomplete, 7 well-developed pores anteriorly, indistinct traces of pores posteriorly. Caudal rounded. First dorsal spine small, second half as long as the third, the latter is longest and strongest; twice in head. Colour in alcohol buff, a dusky brown stripe from snout to eye, another from eye to throat, a third from upper third of eye across opercles to lateral line, a fourth across nape; traces of three stripes on sides, first from in front of dorsal downward toward angle of praeoperculum, second from under origin of dorsal to behind pectoral base, the third under middle of spinous dorsal; slight traces of mottlings on first dorsal; ventrals mottled with grayish white; other fins hyaline. Length 47 mm. [After SMITH and RADCLIFFE, not seen by us].

Habitat: Talisse island, North Celebes.

3. Foa longimana M. Web.

Foa longimana M. Weber, Notes Leyden Museum XXXI. 1909, p. 162. — Siboga Exp. Fische, 1913, p. 238.

D^1 VI (or VII?); D^2 I.9; A. II.8; L.l. 22; L.tr. $\frac{1}{1}$ $\frac{}{5—6}$.

Height 3. Head nearly 2.5. Eye 3.5, only slightly longer than snout. Lower jaw scarcely prominent. Maxillary reaching almost to below hindborder of eye. Praeoperculum smooth. Teeth fine (on vomer and palatines?). Scales ctenoid, excepting the large cycloid scales on operculum. Lateral line incomplete, ending below origin of second dorsal, the eleven first scales having tubes. Caudal rounded. Pectorals almost as long as head. Colour of alcohol specimen yellowish, mottled all over with fine brown spots. First dorsal, hindermost part of second dorsal and anal, pectorals and greater part of ventrals darkbrown. Caudal hyaline. Length of single specimen known 19 mm. [Type in Zoological Museum of Amsterdam seen by us].

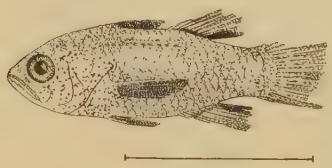

Fig. 83. *Foa longimana* M. Web. $2^1/_2 \times$.

Habitat: Nusa laut; pelagic.

4. Foa vaiulae Jord. & Seale.

Foa vaiulae Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 249.
Apogon vaiulae Kendall & Goldsborough, Mem. Mus. Comp. Zool. Harvard Coll. XXVI n° 7, 1911, p. 278.

D^1 VII; D^2 I. 9; A. II. 8; P. 11; V. I. 5; L.l. 23; L.tr. $\frac{1\frac{1}{2}}{1}$. $\frac{}{6\frac{1}{2}}$

Height 2.6, 3.5 in length with caudal. Head 2.2, 3 in length with caudal. Eye 3.5. Snout shorter than eye; interorbital space narrow, 2.6 in eye. Mouth somewhat oblique, maxillary reaching to below posterior half of eye. Lower jaw scarcely prominent. Narrow bands of teeth in jaws and on vomer, none on palatines. None of the bones of the head serrated. First dorsal spine minute, second one more than half of third, which is longer and stronger than the others and scarcely less than postorbital part of head. Spine of second dorsal equal to second anal spine and to eye. Pectorals and ventrals subequal, equal to suborbital part of head and half eyediameter together. Caudal rounded. Least height of caudal peduncle less than postorbital part of head, 1.7 in its length. All scales ctenoid. Lateral line continued only to ninth scale from head, ending below origin of second dorsal. Colour in alcohol yellowish, the scales with numerous small dots of unequal size, giving to the body a mottled appearance. A dark brown elongate patch above operculum, which has an indistinct dark patch. Two similar but smaller patches on upper part of cheeks just behind eye. Pectorals hyaline. Other fins mottled with dark dots, darkest on first dorsal, which also has black blotches between third, fourth and fifth spine at tip of fin. The dots form three to four irregular transverse bars on caudal. Length 42 mm.

Habitat: Pulu Serbete near Flores!. — Samoa, Fidji islands.

Note. We made the description after a single specimen of 42 mm. length from Pulu Serbete. It agrees with the description and figure of JORDAN & SEALE, but for the lack of teeth on the palatines and the somewhat larger head. It is very much like *Apogon perdix* Blkr. differing by the incomplete lateral line.

4. Siphamia M. Weber.

(M. WEBER, Notes Leyden Museum XXXI. 1909, p. 168).

Scales large, ctenoid. Those on sides behind pectorals forming

a row of very large oval ones. Four or five keeled scales before first dorsal. Scales on opercles large. Lateral line complete. Teeth in jaws unequal, partly fine, and in bands, partly larger and curved. Vomer and palatines with fine small teeth. Praeopercular border serrated. Caudal deeply incised. About seven short gillrakers. Seven branchiostegals. Anal with 8 to 9 soft rays. A tube-like prolongation of the body cavity continued at both sides along lower part of body and caudal peduncle to base of caudal [1]).

Distribution: that of the single species known.

1. **Siphamia tubifer** M. Web. [Fig. 84, p. 356].

Siphamia tubifer M. Weber, Notes Leyden Museum XXXI. 1909, p. 168 — Siboga Exp. Fische 1913, p. 243.

D^1 VII; D^2 I. 9; A. II. 8—9; P. 14; V. I. 5; L.l. 23—24; L.tr. $\frac{1}{\frac{1}{5}}$.

Oblong. Height about 2.6, 3.3 in length with caudal. Head about 2.5, 3 in length with caudal. Eye 2.7. Snout about equal to interorbital space or half diameter of eye. Lower jaw slightly projecting. Mouth oblique, maxillary reaching to below hinder-half of eye. Dorsal spines rather strong, the third the longest

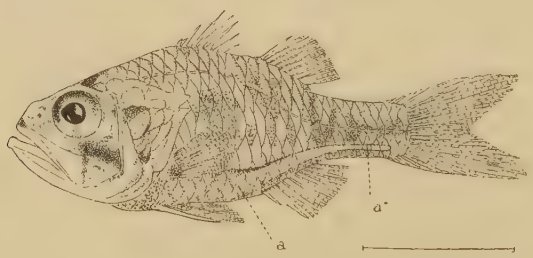

Fig. 84. *Siphamia tubifer* M. Web. × 2.
a a Peritoneal tubes.

and almost as long as height of second dorsal. First dorsal spine one third of second, which is two thirds of third spine. Second dorsal and anal scarcely convex, somewhat higher than half height of body. Colour of alcohol specimens deep bronze coloured with two more or less distinct broad silvery bands from posterior border of eye to caudal. The two peri-

1) For particulars see M. Weber, Siboga Exp. Fische 1913, p. 244.

toneal tubes are silvery, more or less bordered with black and with many transverse black lines, they taper towards their end. Cavity of mouth and tongue black. Length 40 mm. [Type in Zoological Museum of Amsterdam seen by us].

Habitat: Timor 27—54 M.! Sandy bottom.

5. Rhabdamia M. Weber.

(M. Weber, Notes Leyden Museum XXXI. 1909, p. 165).

Scales moderate, cycloid, deciduous, those on opercles small. Lateral line complete. Fine teeth in bands in upper jaw, somewhat larger ones in lower jaw, those of vomer similar to the maxillary teeth. None or a few only on palatines. Praeopercular border smooth. Caudal deeply incised. Gillrakers long and numerous (about 22). First dorsal with six spines, second one with one spine and nine to ten soft rays. Anal with nine to thirteen soft rays. No tube-like prolongations of the body-cavity beyond anus.

Distribution: Two species known, restricted to the indo-australian Archipelago.

Key to the species of Rhabdamia.

1. Anal with 12—13 soft rays . . . . . *A. gracilis* p. 357.
2. Anal with 9 soft rays . . . . . *A. cypsilurus* p. 358.

1. Rhabdamia gracilis (Blkr.) [Fig. 85, p. 358].

Apogonichthys gracilis Bleeker, Nat. Tijdschr. Ned. Indië X. 1856, p. 371.
Amia gracilis Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 69. — Atl. ichth. VII. 1873—1876, p. 102.
Rhabdamia clupeiformis M. Weber, Notes Leyden Mus. XXXI. 1909, p. 165. — Siboga Exp. Fische, 1913, p. 241.

D^1 VI; D^2 I.9 (10); A. II.12—13; P. 2.11—12; L.l. 25; L.tr. $\frac{1\frac{1}{2}}{6}$.

Rather elongate. Dorsal profile not much more convex than ventral one. Height 3.2—3.7, 3.9—4.8 in length with caudal. Head 2.5—3, 3.5—3.6 in length with caudal. Eye about 3, longer than snout and than interorbital space. Mouth oblique, lower jaw somewhat projecting. Maxillary reaching to below anterior half of eye. Praemaxillary with a narrow band of very fine teeth and an outer row of somewhat larger ones. Only this row is present in the lower jaw. Vomer with a semi-

crescentic shaped row of somewhat larger teeth. None or a few only on the palatines. Bones of the head without serrations. Dorsal spines weak; the third the longest, the second and fifth only slightly shorter, the first somewhat shorter than the second. Height of second dorsal 1.5 of first and 2.5 in height of body, its upper border feebly concave. Height of anal equal to postorbital part of head, its lower border concave. Caudal incised. Ventrals reaching anus. Pectorals a little shorter than head, their hindborder concave; they reach on anal. Scales cycloid, deciduous, those of opercles small and rounded. Three to four median keeled scales before first dorsal. About 22 slender gillrakers, longer than eye. Colour of alcohol specimens yellowish, sides of head and belly with silvery

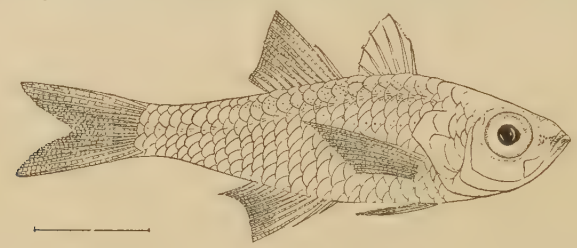

Fig. 85. *Rhabdamia gracilis* (Blkr.) × $1^1/_2$.

reflections. Point of snout and lower jaw powdered with blackish spots (melanophores). Similar spots in a row at base of caudal and along base of anal and also scattered on the back. A longitudinal line, formed by one or two rows of spots, along side of body, but often indistinct or only incompletely developed. Fins hyaline. Length 58 mm. [Types of *A. gracilis* in the Leiden Museum and those of *R. clupeiformis* in the Museum of Amsterdam seen by us].

Habitat: Singapore; Pulu Babi!; Solor!; Salibabu!; Saleyer!; Ternate!. — In sea, near coast on sandy shore.

2. **Rhabdamia cypselurus** M. Web. [Fig. 86, p. 359].

Rhabdamia cypselurus M. Weber, Notes Leyden Mus. XXXI. 1909, p. 167 — Siboga Exp. Fische 1913, p. 242.

D^1 VI; D^2 I. 9; A. II. 9; P. 12—13; Sq.?

Elongate. Height 4.1—4.3, 5—5.2 in length with caudal. Head 2.7—3, 3.3—3.6 in length with caudal. Eye 3—3.2, longer than snout and than interorbital space. Mouth oblique.

Lower jaw somewhat prominent. Maxillary reaching to below anterior half of eye. Praemaxillary with a very narrow band of fine teeth, the lateral teeth somewhat larger and equal to those of the single row in the lower jaw. Vomer with a semicrescentic row of small teeth; none on the palatines. Dorsal spines weak; the first about three fourths of second, which is equal to fourth and somewhat shorter than third; lastnamed spine is the longest and about equal to half of height

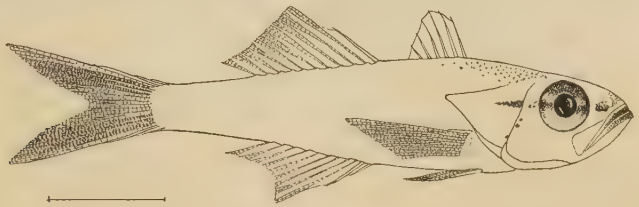

Fig 86. *Rhabdamia cypselurus* M. Web. × $1^1/_2$.

of body. Height of second dorsal equal to three fourths of height of body. Pectorals somewhat shorter than head, reaching on anal. Ventrals reaching anus. Caudal deeply incised with pointed lobes. Scales cycloid, very deciduous, those of opercles small and rounded. Twenty two gillrakers, the longest longer than half eye. Colour of alcohol specimens yellowish, sides of head silvery. A more or less distinct dark band from snout and lower jaw through eye, continued on opercle and sometimes even on anterior part of body. A not always distinct band from eye to corner of praeoperculum. Fins hyaline, upper and lower lobe of caudal with a longitudinal intramarginal darkish band. Length 52 mm. [Type in Zoological Museum of Amsterdam seen by us].

Habitat: Ceram! pelagic.

6. **Cheilodipterus** Lacépède.

(Lacépède, Hist. Nat. Poissons III. 1802, p. 539).
Paramia Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 233.

Scales moderate, ctenoid, those of the head cycloid. Lateral line complete. Distant canines in the jaws, with or without bands of villiform teeth. Teeth on vomer and palatines. Praeoperculum with a double edge, serrated behind or smooth. Caudal feebly incised. First dorsal with six rather feeble spines, anal with two spines and eight soft rays. Cleft of

mouth nearly horizontal. Gillrakers wanting on hypobranchiale or represented only by a knoblike one, 7 to 8 on ceratobranchiale,

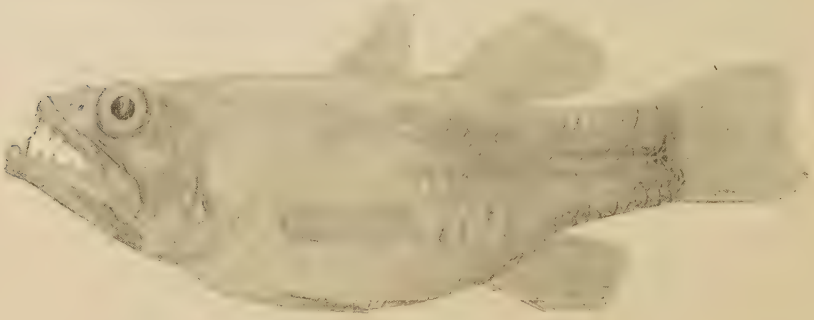

Fig. 87. *Cheilodipterus subulatus* M. Web. ca × $^1/_2$.

denticulated, $^1/_3$ to $^1/_2$ diameter of eye. Vent situated about 3 scales before origin of anal.

Distribution: Indo-Pacific. In sea.

Key to the indo-australian species of Cheilodipterus.

A. Praeoperculum serrated.

I. Maxillary reaching to below hindborder of eye. Canines strong. Second dorsal and anal rounded *C. singapurensis* p. 360.

II. Maxillary not reaching to below hindborder of eye.

a. Body with six longitudinal bands, the first in the median dorsal, the sixth in the median ventral line. Second dorsal and anal rounded. Canines weak . . . . . *C. quinquelineatus* p. 361.

b. Body with eight longitudinal bands, the first in the median dorsal line. Second dorsal and anal truncate or somewhat concave. Canines strong . . . . . *C. macrodon* p. 363.

B. Praeoperculum smooth. Canines very strong . . . *C. subulatus* p. 365.

1. Cheilodipterus singapurensis Blkr.

Cheilodipterus singapurensis Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 452.

Paramia singapurensis Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 78. — Atl. ichth. VII. 1873—1876, p. 106.

Chilodipterus truncatus Günther, Brenchley's Cruise of the „Curaçao" 1873, p. 418.

Paramia truncata Jordan & Seale, Bull. Bur. Fish. Wash. XXV (1905) 1906, p. 252 (name only).

Cheilodipterus singapurensis de Beaufort, Bijdragen tot de Dierk. Afl. 19, 1913, p. 116.

D^1 VI; D^2 I.9; A. II.8; P. 2.10; V. I.5; L.l. 26—27; L.tr. $\frac{2—2\frac{1}{2}}{1}$.
$\frac{}{7}$

Height 2.9—3, 3.5—3.8 in length with caudal. Head 2.4—2.5, 3—3.2 in length with caudal. Eye 3.3—3.8, equal to snout and to twice interorbital space. Mouth slightly oblique, jaws equal, maxillary reaching to below hindmargin of eye or not quite so far in young specimens. Narrow bands of villiform teeth in the jaws and a varying number of very strong, long canines, which are partly subulate. Vomer and palatines with narrow bands of more or less conical teeth. Praeoperculum with serrations along its vertical border, obsolete along its edge and lower border. Praeopercular ridge smooth. First dorsal spine less than half of second, which is slightly stronger than the others, but not so long as the third one, which is equal to snout and half eye. Spine of second dorsal as long as second anal spine and about equal to snout. Second dorsal and anal rounded. Caudal feebly emarginate, the lobes rounded. Ventrals and pectorals subequal, one third of eyediameter longer than postorbital part of head. Colour of alcohol specimens brown, lighter below, with longitudinal bands on head and body (according to BLEEKER wanting on head), narrow in young specimens, broader in adult ones, where they are broader than the interspaces and have a tendency to get diffuse and to merge into the general dark ground-colour. The first band along median line of back, from snout to base of caudal, encircling the bases of the dorsal fins. Second one from snout, above eye to base of caudal, where it joins the first one. Third one from snout through eye to middle of base of caudal, ending in a black spot. Fourth one from upper jaw below eye through base of pectoral to lower part of base of caudal; a fifth indistinct one from corner of mouth to base of anal. First dorsal blackish. Upper and lower rays of caudal and base of ventrals blackish, other fins more or less dusky. Length 175 mm.

Habitat: Singapore; Misol; Waigeu!. In sea.

2. Cheilodipterus quinquelineatus C.V.

Cheilodipterus quinquelineatus Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 167.

Apogon novemstriatus Rüppell, Neue Wirbelthiere, Fische, 1837, p. 85.

Cheilodipterus quinquelineatus Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 252.
Chilodipterus quinquelineatus Günther, Cat. Brit. Mus. I. 1859, p. 248.
Paramia quinquelineata Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 147.
Cheilodipterus quinquelineatus Klunzinger, Abh. zool. bot. Ges. Wien XX. 1870, p. 716.
Paramia quinquelineata Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 76. — Atl. ichth. VII. 1873—1876, p. 105.
Chilodipterus quinquelineatus Day, Fishes of India 4° 1875—1878, p. 66.
Cheilodipterus quinquelineatus Macleay, Descr. Cat. Austr. Fish. I. 1881, p. 48.
Chilodipterus quinquelineatus Steindachner & Döderlein, Denkschr. Akad. Wien XLVIII. 1883, Fische Japans II, p. 4.
Chilodipterus quinquelineatus Klunzinger, Fische des Rothen Meeres I. 1884, p. 23.
Paramia quinquelineata Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906 p. 252.
Cheilodipterus quinquelineatus M. Weber, Siboga Exp. Fische 1913, p. 239.

D^1 VI; D^2 I.9; A. II.8; P. 2.10; V. I.5; L.l. 25—26; L.tr. $\frac{2}{1}$.
$6\frac{1}{2}$

Height 3.2—3.8, 4—4.6 in length with caudal. Head 2.6—2.8, 3.2—3.6 in length with caudal. Eye about 3; snout three fourths or seven eighths of eye. Interorbital space about half eye. Mouth scarcely oblique. Jaws equal. Maxillary reaching to below posterior half of eye. Narrow bands of villiform teeth in the jaws. Two canines on each side in the anterior part of the praemaxillary. A small canine on each side near symphysis of lower jaw, and about five, decreasing in size posteriorly, in the middle of each ramus. Vomer and palatines with small teeth. Free border of praeoperculum serrated, other bones of the head with smooth borders. Dorsal spines weak. First one more than half length of second, which is equal to third and about as long as postorbital part of head. Spine of second dorsal and second spine of anal subequal, only slightly shorter than longest spine of first dorsal. Hindborder of second dorsal and of anal rounded. Caudal incised, the lobes rounded. Ventrals slightly shorter than pectorals and equal to eye and snout. Least height of caudal peduncle equal to eye and twice in its length. Colour of alcohol specimens yellowish, with narrower or broader longitudinal stripes: a median one from snout, dividing at base of dorsal, united again behind second dorsal and running to upper part of caudal, where it may be continued on the outer caudal rays. Second one from snout above eye along upper part of sides to base of caudal, where it unites with the first one. The third from snout, interrupted

by the eye, running along median line of head and body to base of caudal, where it ends before a black spot, encircled by light yellow. Fourth stripe from tip of lower jaw, below eye through base of pectoral to inferior part of base of caudal, where it unites with the fifth one, and may be continued on lower caudal rays. Fifth stripe from chin to base of anal; behind this fin it unites with that of the other side and is continued on lower side of caudal peduncle. A sixth median stripe on breast from istmus to anus, running between the bases of pectorals. Anterior border of dorsal blackish. Second dorsal, anal and caudal more or less dusky. Pectorals and ventrals yellowish. Length over 100 mm. [A specimen of BLEEKER's collection in the Zoological Museum of Amsterdam seen by us].

Habitat: Singapore; Sumatra (Siboga); Nias!; Batu islands!; Banka; Billiton; Java (Batavia); Celebes (Menado); Saleyer!; Biaru!; Sangir islands; Solor; Halmahera; Ternate; Batjan; Buru; Ambon; Goram; Kei islands!; New Guinea. — From Zanzibar, Red Sea, Aden, coasts of British India to Japan and eastwards to the Marquesas islands. In sea.

3. Cheilodipterus macrodon (Lac.)

Centropomus macrodon Lacépède, Hist. Nat. Poissons IV. 1802, p. 273.
Cheilodipterus lineatus Lacépède, l. c. p. 543 (nec Forskål).
Cheilodipterus octovittatus Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 163.
Cheilodipterus heptazona Bleeker, Nat. & Geneesk. Arch. Ned. Indië II. 1845, p. 526. — Verh. Bat. Gen. XXII. 1849, Percoid. p. 29.
Chilodipterus octovittatus Günther, Cat. Brit. Mus. I. 1859, p. 248 (nec Forskål).
Cheilodipterus lineatus Bleeker, Nat. Tijdschr. Ned. Indië XVIII. 1859, p. 352 (nec Forskål).
Paramia lineata Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 284 (nec Forskål).
Cheilodipterus octovittatus Klunzinger, Abh. zool. bot. Ges. Wien XX. 1870, p. 717.
Paramia macrodon Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 75. — Atl. ichth. VII. 1873—1876, p. 105.
Paramia octolineata Bleeker, Atl. ichth. l.c. Tab. 305, Fig. 2.
Cheilodipterus lineatus Day, Fishes of India 4°, 1875—1878, p. 66. (nec Forskål).
Chilodipterus macrodon Klunzinger, Fische des Rothen Meeres I. 1884, p. 23.
Chilodipterus macrodon Day, Fishes of India 4°, Suppl. 1888, p. 785. — Fauna of British India, Fishes I. 1889, p. 501.
Paramia macrodon Jordan & Seale, Bull. Bureau Fisheries XXV. (1905) 1906, p. 252.
Cheilodipterus lineatus de Beaufort, Bijdr. tot de Dierkunde Afl. 19, 1913, p. 116 (nec Forskål).

D^1 VI; D^2 I. 9; A. II. 8; P. 2.9.2; V. I. 5; L.l. 26; L.tr. $\frac{2}{1}$.
$\frac{}{6\frac{1}{2}}$

Height 3.1—3.7, 4—4.7 in length with caudal. Head 2.5—2.8, 3.1—3.5 in length with caudal. Eye about 3, slightly more than snout. Interorbital space about three fourths of eye. Mouth somewhat oblique, jaws equal or lower jaw slightly included. Maxillary reaching to below hindborder of pupil. Very narrow bands of conical teeth in the jaws, more developed posteriorly than anteriorly and five or more large canines in each ramus, some of them subulate. Vomer and palatines with a narrow band of conical teeth, some of those on the vomer enlarged. Praeoperculum serrated, praeopercular ridge and praeorbital smooth. Dorsal spines weak. Spine of second dorsal equal to or somewhat longer than second anal spine, equal to distance between anterior border of pupil and tip of snout. Hindborder of soft dorsal and anal straight or somewhat concave. Pectorals and ventrals subequal, about as long as snout and eye. Caudal incised, the lobes rounded. Least height of caudal peduncle 1.5—2 in its length. Colour of alcohol specimens yellowish, with dark brown longitudinal bands equal to or broader or smaller than the interspaces. The first one, which is often indistinct, along median dorsal line from snout to base of caudal, divided in two before base of first dorsal and united again behind second dorsal. Second one from snout above eye to base of caudal. Third, fourth and fifth from eye to base of caudal, the fourth one in the median line of the body. Sixth from below eye through base of pectorals to lower part of base of caudal. Seventh from isthmus to end of base of anal. Eighth from base of ventrals, along base of anal, often indistinct. A dark blotch at middle of base of caudal, often forming a band encircling the caudal peduncle. Upper part of first dorsal more or less black. Upper and lower caudal rays dark brown. Anterior border of second dorsal and anal somewhat dusky, rest of the fins yellowish, ventrals often blackish in their posterior part. Length over 200 mm.

Nom. indig.: Glaga gigi (Malay Batavia).

Habitat: Pulu Weh!; Singapore; Batu islands; Nias!; Java (Batavia); Bawean; Celebes (Makassar, Bulucomba, Badjoa, Menado); Saleyer!; Buton!; Batjan; Ambon; New Guinea. — From the coast of East Africa, Red Sea, seas of India to Queensland, Samoa and Paumotu islands. — In sea.

Note. In younger specimens the bands on the body seem to be narrower, the caudal spot more rounded and the caudal peduncle more slender. These specimens have therefore some resemblance with *Ch. lineatus* Forsk. as described by KLUNZINGER, but they differ by having 14—16 instead of 8—9 bands on each side. The development of the caudal spot into a vertical band in larger specimens may be in correlation with the unequal growth of the caudal peduncle.

4. Cheilodipterus subulatus M. Web.

[Fig. 87, p. 360].

Cheilodipterus subulatus M. Weber, Notes Leyden Mus. XXXI. 1909, p. 164. — Siboga Exp. Fische 1913, p. 239.

D^1 VI; D^2 I. 9; A. II. 8; P. 1.11; V. I. 5; L.l. 25; L.tr. $\frac{2}{1}$ $\frac{}{6—7}$.

Height 2.6, 3.3 in length with caudal. Head 2.3, nearly 3 in total length. Eye somewhat more than 4, equal to snout and three fourths of interorbital space. Mouth oblique, jaws equal in front, chin scarcely prominent. Maxillary reaching to below hindmargin of eye. Praeoperculum and other bones of the head smooth. Praemaxillary behind with a band of villiform teeth, anteriorly with about three lancet-shaped canini, followed posteriorly by 3 long canines, the first of which outside the lower jaw and covered by the lower lip, when the mouth is closed. In the lower jaw near symphysis a very long pointed caninus, fitting into a deep groove behind the praemaxillary, followed posteriorly by several smaller ones. No small teeth in the lower jaw. Vomer and palatines with a band of small teeth. First dorsal spine one fourth of second, which is stronger than the others but as long as the third and equal to snout and half diameter of eye together. Spine of second dorsal scarcely longer than second anal spine and equal to eye. Second dorsal and anal rounded. Ventrals slightly shorter than pectorals, which are as long as eye and snout together. Caudal feebly incised, the lobes rounded. Least height of caudal peduncle 1.1 in its length. Scales ctenoid, those before dorsal, on operculum and cheeks cycloid. Colour of alcohol specimen yellowish brown, with very faint traces of longitudinal bands. Upper part of first dorsal and base of caudal darkish, other fins hyaline. Length of single specimen known

220 mm. [Type in the Zoological Museum of Amsterdam seen by us].

Habitat: Celebes (Makassar!). — In sea.

7. Synagrops Günther.

(Günther, Challenger Report XXII, 1887, p. 162).
Melanostoma Döderlein, Denkschr. Akad. Wien XLVIII. 1884, p. 5 (name preoccupied).
Parascombrops Alcock, Journ. Asiat. Soc. Bengal LXIII, 2, 1894, p. 2.
Hypoclydonia Goode & Bean, Oceanic Ichthyol. 1895, p. 236.

Elongate, compressed, covered with rather large, thin, deciduous cycloid scales, which on the head are partly subintegumentally embedded. 28—35 scales in lateral line, which runs parallel to dorsal contour. Mouth somewhat oblique, with the lower jaw prominent. Small teeth in bands on jaws, vomer and palatines. A pair of strong canines in front of upper jaw. A smaller pair on symphysis of lower jaw, separated by a

Fig. 88. *Synagrops malayanus* M. Web. × 1 1/2.

depression of the bone, to fit the intermaxillary canines; up to 7 stronger canines in the middle part of the lower jaw inside of the row of small teeth. Operculum with 2 small spines; praeoperculum with two edges, both serrated. First dorsal with 8—9 slender and weak spines; second dorsal with a weak spine and 8—10 rays; anal II, 7—8. Second spine of first dorsal and first spine of second dorsal and spine of anal may be serrated, spine of ventral often so. The base of second dorsal, anal, ventral and caudal covered with small scales. Vent normal, close in front of anal.

Distribution. Deep Sea of Indo-australian Archipelago, Philippines, Japan, Hawaii, Bay of Bengal, Natal. — Gulf of Mexico *(Hypoclydonia)*. In depths up to 540 m.

1. **Synagrops malayanus** M. Web. [Fig. 88, p. 366].

Synagrops malayanus M. Weber, Siboga Exp. Fische, 1913, p. 196.

D^1 VIII; D^2 I.8 (9); A. II.7; P. 1.15; V. I.5; L.l. circa 30?; L.tr. ?

Height 3.5—3.8, 4.2—4.5 in length with caudal. Head 2.5—2.6, 3—3.3 in length with caudal. Eyes 3.2. Snout almost equal to or shorter than eye. Interorbital space about four fifths of eye. Mouth oblique. Lower jaw the longer, chin somewhat prominent. Maxillary reaching to below middle of eye. Praeopercular ridge with some denticulations at its angle; free border of praeoperculum serrated behind and below; posterior part of interoperculum and anterior part of suboperculum feebly serrated. Villiform teeth in bands in jaws, that of lower jaw somewhat narrower. Two long canines in upper jaw near symphysis, directed backwards. Lower jaw with a small canine in each ramus near symphysis, followed by an emargination of the bone to fit the canines of the upper jaw. Behind this emargination two distant large canines, sometimes with a smaller one in front. Vomer with a patch of teeth in the form of a $\wedge$, palatines with one row of teeth. Dorsal spines moderately strong, the first one small, the second one three fourths length of third, which, together with the fourth, is stronger and longer than the others, and equal to snout and eye together. Second dorsal, anal, caudal and ventrals thickly covered with small longish scales. Spine of ventrals strong, 1.5 the length of the eye and provided with 30—40 small spines, regularly arranged and directed backwards and outwards. Pectorals as long as head without snout. Caudal deeply incised. Scales cycloid. Colour of alcohol specimens yellowish, silvery below and on sides of head. Scale-pouches of back bordered with darkbrown. Superior part of head and snout, dorsal fins and caudal powdered with darkbrown. Other fins hyaline. Length 66 mm. [Type in the Zoological Museum of Amsterdam].

Habitat: Bali sea, 100 M.!; Timor sea, 216 M.!; Strait Lobetobi, Savu sea, 247 M.!.

8. **Acropoma** Schlegel.

(Schlegel in Temminck & Schlegel, Fauna japonica Poissons 1846, p. 31).

Oblong, compressed, covered with moderate, deciduous, cycloid or feebly ctenoid scales; complete, curved lateral line in upper part of body. Mouth large, oblique; symphysis of

lower jaw strongly prominent. Small villiform teeth in upper jaw, palatines and vomer; those on lower jaw larger, in one or more series. A pair of large canines at the symphysis and an opposite one on the upper jaw. First dorsal with VII—IX slender spines, second dorsal with one spine and 10 rays, anal with 3 weak spines and 7—8 rays. No spines serrated. Caudal incised. Gillmembranes separate, gillrakers long and numerous. Opercle with a long flap, with 2 or 3 small denticles; praeopercle with a double edge, entire or serrated. Vent far forward, much nearer to base of ventrals than to anal.

Distribution: Japan, Arafura Sea, Gulf of Oman [1]) and Natal, in deep water till about 450 m.

Note. DAVID STARR JORDAN (Classificat. of Fishes 1923, p. 188 and 189) places *Acropoma, Oxyodon* and *Brephostoma* in a family „*Acropomatidae* with three anal spines, vent anterior" and distinguishes it from the family *Apogonidae* „with two anal spines, rarely one and with the vent normal in position". But *Oxyodon* (see p. 351) has no more than two and *Brephostoma* only one anal spine; only *Acropoma* has three. The situation of the vent in *Brephostoma* is not known; that of *Oxyodon* and *Acropoma* is indeed nearer to the ventrals than to the anal but there are species of *Apogon* who show the same situation of the vent and also in *Cheilodipterus* it is not „normal". Therefore the validity of the family *Acropomatidae* in the sense of JORDAN, comprising *Oxyodon* Brauer, *Acropoma* Schlegel and *Brephostoma* Alcock [2]), seems to us problematic, as long as no other characters, differentiating them from the *Apogonidae* are known.

An other question is, if not *Acropoma* ought to be placed in the *Serranidae*.

The eleven fishes, described by FRANZ (Abh. d. math. physik. Kl. d. Bayer. Akad. d. W. München 1910) from Japan, do not belong to *Acropoma*. He says about them: „Bei Exemplaren bis zu 11 cm Länge liegt der After noch unmit-

1) *Acropoma splendens* Lloyd, Mem. Indian Mus. II, 3, 1909, p. 159, described as *Synagrops splendens*.

2) On page 242 of the above quoted „Classification" of JORDAN erroneously *Brephostoma* Alcock is again cited; this time as a member of the family *Ogcocephalidae*.

telbar vor der Analen," while in *Acropoma* the vent is situated near the base of the ventrals. Probably the specimens of FRANZ belong to *Synagrops* Gthr.

1. Acropoma japonicum Gthr. [Fig. 89, pag. 369.]

Acropoma spec. Schlegel in Temminck & Schlegel, Fauna japonica, Poissons 1846, p. 31.

Acropoma japonicum Günther, Cat. Brit. Mus. I. 1859, p. 250.

Acropoma apogonoides Bleeker, Verh. Akad. Amsterdam XVIII. (1877) 1878, p. 6 (name only).

Acropoma japonicum Jordan & Snyder Proc. U. S. Nat. Mus. XXIII. 1901, p. 912.

B. 7; D^1 VI; D^2 I, 10; A. III. 7; L.l. ca 49; L.tr. 10—11.

Elongate, compressed; height $3^2/_5$, head $2^3/_5$ in length. Eye $3^1/_4$, height of caudal peduncle $3^1/_3$, convex interorbital

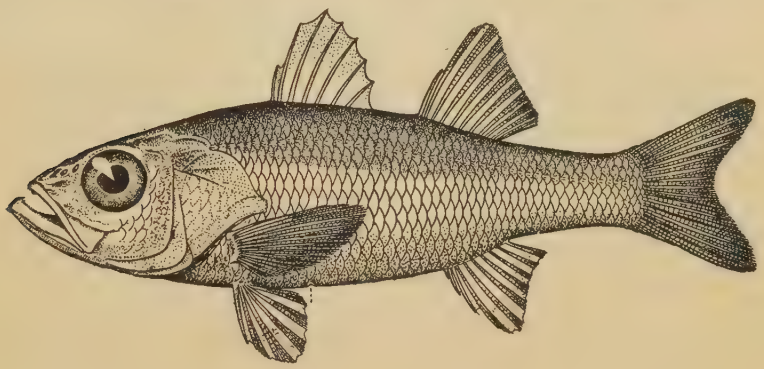

Fig 89. *Acropoma japonicum* Gthr. (After JORDAN & SNYDER).

space $4^1/_2$, snout $3^1/_2$, maxillary $2^2/_5$ in head. Snout pointed, shorter than diameter of eye; lower jaw projecting; maxillary reaching to centre of pupil. Teeth in bands on jaws, vomer and palatines; some of those in front of upper jaw and on tip and sides of lower jaw enlarged into slender canines; tip of lower jaw elevated; the canines on the raised part. Dorsal spines slender, not reaching insertion of soft dorsal when depressed. Anal inserted below a point a little posterior to middle of soft dorsal; edge of both fins concave. Caudal deeply forked. Pectorals pointed, contained about $1^1/_2$ in head. Ventrals about 2 in head, extending beyond anal opening, which is located far forward. Preopercle with a double edge, entire, the posterior part very thin. Opercular flap long, with 2 or 3 small denticulations posteriorly. Gillrakers on first arch 5 + 14;

long and slender. Scales thin, weakly ctenoid, easily displaced. Colour in live light red; lower half abruptely silvery; fins all light ready; inside of gillchamber blackish. Alcoholic specimens retain much of the silver on lower parts, have the upper edge of the orbit dusky and have a somewhat indefinite dusky longitudinal band on lower half of body. Length 125 mm. [After JORDAN & SNYDER, not seen by us].

Habitat: Arafura Sea[1]). — Southern Japan.

9. **Pseudamia** Bleeker.

(BLEEKER, Ned. Tijdschr. Dierk. II. 1865, p. 284).

Scales rather small, cycloid. Lateral line incomplete. Teeth in villiform bands in jaws, on vomer and palatines and a few canines in both jaws. Praeoperculum partly serrated. Nostrils distant, connected by a groove, the anterior one with a tentacle, near point of snout, the posterior one slit-like, near frontborder of eye. Caudal rounded. Gillrakers rather numerous, slender, spiculate. First dorsal with six weak spines, second one with one spine and eight to nine soft rays. Anal with two spines and eight to ten soft rays. Vent situated near origin of anal.

Distribution: Only two species known, bot restricted to the Indo-australian Archipelago and the Philippines.

Key to the species of Pseudamia.

1. First dorsal spine longer than the others. Head and body spotted . . . . . *P. polystigma* p. 370.
2. Second dorsal spine longer than the others. Head and body longitudinally striped . . . . . *P. amblyuropterus* p. 371.

1. **Pseudamia polystigma** (Blkr.) [Fig. 90, p. 371].

Cheilodipterus polystigma Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 454.
Pseudamia polystigma Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 284. — Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 80. — Atl. ichth. VII. 1873—1876, p. 107.
Pseudamia polystigma Jordan & Seale, Bull. Bureau Fish. XXVI. (1906) 1907, p. 17.
Pseudamia polystigma Seale, Phil. Journ. Sci. V. n° 4, 1910, p. 274.

D^1 VI; D^2 1.9; A. II.8; P. 2.14; V. I.5; L.l. circa 44; L.tr. $\frac{4}{1}$ $\frac{}{16—17}$.

Height 3.8, 4.2 in length with caudal. Head 2.7, 3.4 in

1) GÜNTHER (Challenger Reports, Zoology VI. 1880, p. 38) mentions this species from Arafura Sea with a query and the addition „(not in good state)".

length with caudal. Eye 3.7, slightly more than very convex interorbital space and than snout. Jaws equal. Maxillary almost reaching to below hindborder of eye. Mouth somewhat oblique. Villiform teeth in bands in jaws; two fangs on each side in lower jaw and one in each praemaxillary near symphysis directed backwards. Narrow bands of villiform teeth on vomer and on palatines. A few indistinct spines at angle of praeoperculum, the border of which is otherwise smooth. Dorsal spines weak, the first one the longest and somewhat shorter than postorbital part of head. Second dorsal and anal about equal in height, higher than first dorsal. Pectorals equal to postorbital part of head and half diameter of eye together.

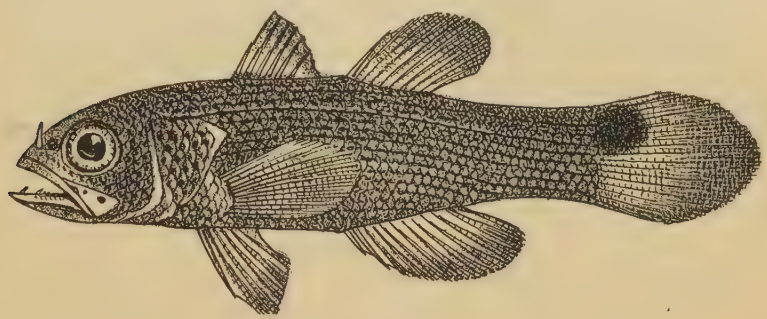

Fig. 90. *Pseudamia polystigma* Blkr. After BLEEKER.

Ventrals with a weak spine, about equal to snout and eye. Caudal rounded. Least height of caudal peduncle somewhat less than postorbital part of head, 1.5 in its length. Lateral line ending below end of base of first dorsal. Colour of alcohol specimen yellowish brown, each scale with a darker speck; small silvery ocelli surrounded by brown rings, scattered on head. A dark blotch on upper part of caudal peduncle. Length 114 mm. [Description made after the type seen by us in the Leiden Museum].

Habitat: Singapore!; Borneo (Sandakan); Ambon!. — Philippines. In sea.

2. **Pseudamia amblyuropterus** (Blkr.)

Cheilodipterus amblyuropterus Bleeker, Nat. Tijdschr. Ned. Indië XI. 1856, p. 395.
Paramia amblyuropterus Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 147.
Pseudamia amblyuropterus Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 1 (1873) 1874, Révision Apogon. p. 81. — Atl. ichth. VII. 1873—1876, p. 107.

D^{1} VI; D^{2} I. 8—9; A. II.9—10; P. 2.14; V. I. 5; L.l. 36? L.tr.?

Height 5.2 in total length. Head 4 in total length. Eye almost 3, three fourths eyediameter apart. Posterior border of praeoperculum partly serrated. Jaws equal. Mouth oblique; maxillary reaching to below hindborder of eye. Teeth in jaws in several rows. A long subulate canine on each ramus of praemaxillary near the symphysis; lower jaw with several canine or caninoid teeth, a subulate one in the middle of the bone much longer than the others. Teeth on vomer and palatines distinct, unequal. Dorsal spines very weak, second spine the longest, less than half height of body. Anal a little lower than second dorsal; both fins rounded. Pectorals 4.7, ventrals 6.3 in total length. Colour pinkish silvery, with 13 to 14 narrow crowded blackish longitudinal bands. Caudal peduncle at base of caudal black, the black colour somewhat spread on caudal too. Spinous dorsal and caudal blackish brown. Second dorsal and anal brown, crossed in their middle by a longitudinal pink band. Pectorals and ventrals pink. Length of single specimen known 50 mm. [After BLEEKER, not seen by us].

Habitat: Buru. In sea.

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3. Fam. PLESIOPIDAE [1]).

Oblong, compressed; body covered with large or moderate ctenoid or ciliated scales; lateral line interrupted, constituting a longer superior branch, running close to dorsal fin and a shorter inferior one, the sensory tubes being straight and extending along a considerable portion of the scale, forming together a continuous line. Mouth moderate, protractile; maxillary with a supplemental bone; jaws equal, with villiform and slightly enlarged or canine teeth. Teeth on vomer and pala-

1) The genera *Acanthoclinus* Jenyns, from New Zealand, and *Acanthoplesiops* Regan (1912) = *Acanthoclinus indicus* Day (Proc. Zool. Soc. London 1888, p. 264) from India, are regarded by REGAN (1913) as belonging to the family *Plesiopidae*. We prefer to separate them from the *Plesiopidae* from which they differ by the increased number of dorsal and anal spines, by the ventrals with only 2 rays, by a single or 3—4 lateral lines, by the absence of a subocular shelf and by the increased number of vertebrae. Both may be united in the family *Acanthoclinidae* Gthr., a family also recognised by JORDAN (1923) and related to the *Plesiopidae*.

tines few in number or in villiform bands. Lingual teeth present or absent. Pseudobranchiae present; 6 branchiostegals; gill-rakers long and slender. Praeoperculum and operculum entire. Branchiostegal membranes separate or united in front. A single dorsal fin, its spinous part as long as or much longer than the soft part; the spines more or less strong, totally or only at their base united by membrane. Anal with 3 spines. Base of dorsal and anal with or without scales. Caudal rounded or pointed. Pectorals short and rounded. Ventrals close together, below or slightly in advance of pectorals; with one spine and 4 rays, the first of which is thickened and produced or not.

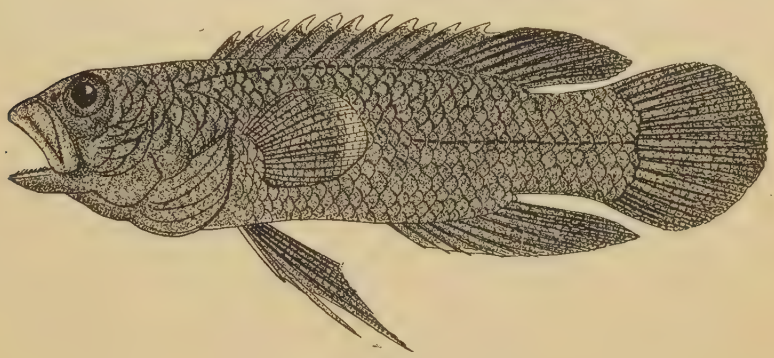

Fig. 91. *Plesiops melas* Blkr.

Posterior processes of intermaxillaries extending to frontal bones. A subocular shelf present. Vertebrae 25 (10 + 15) to 26 (10 + 16).

Distribution: Indopacific. Carnivorous, litoral fishes from the East-coast of Africa to the coast of China, Polynesia and the East- & South-coast of Australia.

Note. The opinions about the systematic position of *Plesiops* differ greatly.

Bleeker (Verh. Akad. Amsterdam XV. 1875 and again in his Syst. Percarum revis. II, Arch. néerl. XI. 1876, p. 322) places them in accordance with Müller & Troschel (Horae ichth. III. 1849), in a family „*Pseudochromoidei*" containing the Phalanges *Cichlopsini*, *Plesiopini* and *Pseudoplesiopini* of which he gave an ample diagnosis in his first named paper, distinguishing it from the neighbouring family of the *Nandoidei* by the presence of pseudobranchiae, by the absence of sphenoidal teeth and by the presence of 15 divided rays in the caudal.

GÜNTHER (Cat. Brit. Mus. III. 1861) created a family *Nandidae* comprising those members of the *Pseudochromides* and *Maenoidei* of MÜLLER & TROSCHEL (v.s.) which are distinguished by an interrupted lateral line. He divided them in the 3 groups *Plesiopina*, *Nandina* and *Acharnina*. In this arrangement he was followed by KLUNZINGER (Fische Roth. Meer. 1884, p. 66).

By BOULENGER (Cat. Perciform Fishes 1895) *Plesiops*, together with *Pseudoplesiops* Blkr. and *Paraplesiops* Blkr., was located near *Callanthias* in the first Subfamily Serranina of his family *Serranidae*: an arrangement which was repeated in his „Fishes" in the Cambridge Natural History vol. VII. 1904. The *Pseudochromididae* he calls closely allied to the *Serranidae*, and connected with them through *Plesiops* and its allies. A similar opinion is expressed by JORDAN (A classification of fishes 1923, p. 194) as, according to him, the *Plesiopidae*, *Acanthoclinidae* [1]), *Pseudoplesiopidae* and *Pseudochromidae* are closely related, and also allied to the *Anthiinae* among the *Serranidae*.

In any case these authors are in accordance with REGAN (Classification of the Percoid Fishes, Ann. & Mag. Nat. Hist. (8) XII. 1913, p. 114), who places the *Plesiopidae* next to the 1. Family *Serranidae* of his Suborder Percoidea. The family of *Plesiopidae* comprises by REGAN the genera *Trachinops*, *Plesiops*, *Paraplesiops*, *Acanthoplesiops* and *Acanthoclinus*. The aberrant genus *Pseudoplesiops* Blkr. has after him the value of a distinct family *Pseudoplesiopidae*, while the *Pseudochromididae* do not seem to him deserving of family rank. About *Acanthoplesiops* and *Acanthoclinus* we have expressed our opinion on page 372.

1. **Plesiops** Cuvier.

(CUVIER, Règne animal II, 1817, p. 266.)
Pharopterix Rüppell, Atl. Fische Roth. Meeres, 1828, p. 15.

Oblong, compressed, covered on opercle and body with large, on head with smaller scales, which are on body spinulous or finely ciliated. Lateral line interrupted; its upper branch runs close to the base of the dorsal and terminates below its soft rays or on the caudal peduncle; the shorter lower branch runs along the middle of the sides, begins about opposite the last dorsal spines and terminates on the caudal. The sensory

1) Quoted on page 372.

tubes form a straight line on the greater part of the scale. Mouth moderately protractile, jaws about equal, maxillary with a supplemental bone, extending to middle or behind eye. Villiform and slightly enlarged conical teeth in series in jaws; bands of villiform teeth on vomer and palatines; tongue toothless. Praeoperculum and operculum entire. Gillmembranes separate; six branchiostegals; four gills; gillrakers short; pseudobranchiae present. A single dorsal fin with 11—12 spines and 6—9 rays; the membrane in the spinous portion, which is about thrice longer than the soft portion, deeply notched between the spines, which slightly increase in size posteriorly. Anal short with 3 spines and 6—9 rays; base of anal and dorsal scaly. Caudal rounded. Pectorals short, rounded, with 19—21 rays. Ventrals below pectorals, close together, with a spine and 4 rays of which the first is thickened elongate and bifid. Vertebrae 25 (10 + 15).

Distribution: Carnivorous, litoral fishes of the Indo-Pacific, from the East-coast of Africa to the coast of China, Australia and Polynesia.

Artificial key to the indo-australian species of Plesiops.

I. Operculum with an ocellus, head or head and body dotted. Praeoperculum with 4—5 oblique series of scales. Rostro-frontal line convex. D. XII, 6—7 . . *P. nigricans* p. 375.

II. No opercular ocellus; head and body dotted.

a. Praeoperculum rounded, with 7 oblique series of scales. Rostro-frontal line straight. Maxillary reaching behind eye. D. XII, 7—8. . . . . *P. oxycephalus* p. 377.

b. Praeopercular borders meet in a straight angle. Rostro-frontal line convex?. Maxillary reaching behind vertical through middle of eye. D. XI, 9. *P. altivelis* p. 377.

III. Neither opercular ocellus, nor dots on head and body. Praeoperculum with 4—5 oblique series of scales. Rostro-frontal line convex. D. XI, 8 . . . . . *P. melas* p. 378.

1. Plesiops nigricans (Rüpp.).

Pharopteryx nigricans Rüppell, Atlas Fische d. Roth. Meeres 1828, p. 15.
Plesiops nigricans Rüppell, Neue Wirbelth. Abyssinien, Fische 1835, p. 5.
Plesiops caeruleolineatus Rüppell, ibid.
Plesiops coeruleolineatus Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 116.
Plesiops corallicola Bleeker, l.c. p. 280.

Plesiops nigricans Günther, Cat. Brit. Mus. III. 1859—61, p. 363.
Plesiops caeruleo-lineatus Günther, l.c. p. 363 (p.p.).
Plesiops corallicola Günther, l.c. p. 364.
Plesiops corallicola Kner, Novara Reise, Fische 1865—1867, p. 214.
Plesiops nigricans Klunzinger, Abh. zool.-bot. Ges. Wien XXI. 1871, p. 517.
Plesiops coeruleolineatus Klunzinger, ibid.
Plesiops corallicola Günther, Südsee-Fische 1873—75, p. 87.
Plesiops nigricans Bleeker, Verh. Akad. Amsterdam XV. 1875, p. 27 (p.p.)
Plesiops nigricans Day, Fishes of India 4°, 1875—1888, p. 128.
Plesiops nigricans Klunzinger, Fische d. Roth. Meeres I. 1884, p. 66.
Plesiops nigricans Boulenger, Cat. Perciform Fishes I. 1895, p. 340.
Pharopteryx nigricans Jordan & Seale, Fishes Samoa 1906, p. 260.
Plesiops nigricans Jordan & Richardson, Bull. Bureau fisheries, Washington XXVII. (1907) 1908, p. 257.
Plesiops nigricans M. Weber, Siboga-Expeditie, Fische, Leiden 1913, p. 212.
Plesiops nigricans de Beaufort, Bijdr. Dierkunde Afl. XIX Leiden 1913, p. 112.

D. XII. 6—7; A. III. 6—7; L.l.r. 26—30; L.tr. ca. $\frac{2}{12}$.

Oblong, compressed; height 3 to $3^1/_2$ in length, 4 to 5 in length with caudal, equal to or somewhat less than head. Eye $3^1/_2$ to 4; its diameter $^1/_3$ longer than snout. Rostro-frontal line convex. Jaws equal; maxillary reaching to behind eye. Praeoperculum with 4 to 5 oblique series of scales. Origin of dorsal above operculum, its spines slightly increasing in length to the last, which equals about half height of body and is much shorter than the rays of the acutely rounded soft dorsal. Third anal spine longest, about $^2/_5$ length of head. Soft anal equalling about in height and form the soft dorsal. Caudal rounded, somewhat shorter than head. Pectorals rounded, their length about equal to that of postocular part of head. Ventrals inserted before origin of pectorals, their first elongate ray reaching anal. Colour, independent of age, more or less brownish olivaceous, scales on head and often on body with a blue spot; on operculum a distinct blue or black, light-edged ocellus; fins blackish, spinous dorsal with a basal whitish (in live blue) stripe; soft dorsal, anal and caudal more or less white edged; caudal sometimes with interradial whitish dots. Length 160 mm.

Habitat: Pulu Weh (Sabang!); Simalur! Nias!; Batu; Sumatra (Padang, Kauer, Priaman, Benkulen, Pulu Tiku, Trussan, Ulakan); Billiton; Bawean; Java (Prigi, Patjitan); Bali; Lombok!; Flores; Solor; Timor; Nusa Laut!; Tiur!; Celebes (Menado, Tanawanko); Sangir; Salibabu!; Halmahera; Ternate; Sula Besi!; Buru; Ambon!; Goram; Lucipara Islands!; Ceram; Waigeu!; New Guinea (Doreh). — Red Sea, Zanzibar, Mau-

ritius, Madagascar, seas of India, Ceylon, Andamans, Nicobars, China, Philippines, Australia, Lord Howe Island, Norfolk Island, South Pacific (Pelew, Samoa, Rotuma, Navigator-, Fiji-, Friendly- and Kingsmill Islands).

2. **Plesiops oxycephalus** Blkr.

Plesiops oxycephalus Bleeker, Nat. Tijdschr. Ned. Indië VIII. 1855, p. 320.
Plesiops oxycephalus Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 279.
Plesiops oxycephalus Bleeker, Verh. Akad. Amsterdam XV. (1873) 1875, p. 29.
Plesiops oxycephalus Boulenger, Catal. Perciform Fish. I. 1895, p. 341.

D. XII. 7—8; A. III. 8—9; P. 2.18; L.l.r. 26; L.tr. 12.

Height $3^2/_3$ to $3^3/_4$; head pointed, $3^1/_2$ in length with caudal. Eyes somewhat more than thrice in head; one half or $^2/_3$ their diameter distant; rostro-frontal line straight. Jaws equal, maxillary reaching slightly behind eye, about twice in head. Preopercle obtusely rounded, its scales arranged in 7 oblique series. Otherwise closely allied to preceding species. Colour above brownish-violet, below lighter or orange violet; opercle without black or violet ocellus; scales with a blue or pearl-coloured dot; spinous dorsal with a longitudinal blue band near its base, soft dorsal and anal with interradial small oblique blue bands; caudal with a horse-shoe-shaped orange band. Length 97 mm. [After BLEEKER, not seen by us].

Habitat: Batu, Ambon.

3. **Plesiops altivelis** Steindach.

Plesiops altivelis Steindachner, Sitzber. Akad. Wien CXII. 1903, p. 17.

D. XI. 9; A. III. 9; P. 19; L.l.r. 25 + 2; L.tr. (to V.) $\frac{2}{1}$.

Head slightly less than 3, height less than $2^2/_5$, caudal $1^2/_5$, ventrals about $1^1/_2$, pectorals 3 in length without caudal. Snout 4, eye somewhat more than $3^1/_2$, breadth of front 5 times in head. Jaws equal; maxillary superiorly with a small supplementary bone, reaching behind vertical through middle of eye. Three series of scales between eye and anterior edge of preopercle, near its corner. Both borders of preopercle meet in a right angle and are entire. A rather high sheath of scales along base of dorsal and anal. The dorsal spines increase uniformly in size to the last; the first is somewhat shorter, the last about twice longer than eye and weaker than the

third anal spine, which goes more than $1^3/_4$ in length of head. The penultimate rays of dorsal and anal, which are the highest, $2^1/_3$—$2^1/_4$ in length of body. The elongated first ventral ray extends beyond the base of anal; the ventral spine is rather long, slender and goes about $1^2/_3$ times in length of head. The upper branch of lateral line terminates below base of last dorsal rays and perforates 20 scales, the lower perforates 7 scales and two on caudal. Hindborder of trunk scales minutely and densely denticulated. Colour coffee brown with darker longitudinal stripes according to series of scales. Minute, sharply defined skyblue dots dispersed over body and fins, most crowded on head, round eye and along underside of lower jaw; those on caudal are the largest. Length of single specimen known 160 mm. [After STEINDACHNER, not seen by us].

Habitat: Nias.

4. **Plesiops melas** Blkr. [Fig. 91, p. 373].

Plesiops melas Bleeker, Verh. Bat. Gen. XXII. (1848) 1849, Bijdr. ichth. fauna Bali, p. 9.
Plesiops nigricans var. *apoda* Kner, Sitzber. Akad. Wien LVIII. 1868, p. 346.
Pharopteryx melas Jordan & Seale, Fishes Samoa, Bull. Bureau of fisheries XXV. 1906, p. 261.
Plesiops melas Jordan & Richardson, Bull. Bureau of fisheries XXVII. (1907) 1908, p. 257.
Plesiops melas Snyder, Proc. U. S. Nat. Mus. Wash. 42, 1912, p. 498.
Pharopteryx melas Ogilby, Mem. Queensland Mus. II, 1913, p. 84.
Plesiops melas M. Weber, Siboga-Expeditie, Fische, Leiden 1913, p. 213.

D. XI. 8; A. III. 9; L.l.r. 22—24; L.tr. $\frac{\frac{1}{1}}{9-10}$.

Height about 3.5, 3.9—4 in length with caudal; head 2.6—2.7, 3.3—3.6 in length with caudal. Rostro-frontal line convex. Praeoperculum with six or seven oblique series of scales.

Otherwise closely allied to the preceding species.

Colour of body and fins brown to blackish brown, without dots or stripes, operculum without ocellus; body with indistinct broad darker transverse bands. Dorsal and anal with a white (in live red) marginal band, more distinct on dorsal. Caudal with an intramarginal dark band. Often body dark brown, without bands, and fins totally blackish with white margin. A dark patch immediately behind eye and a dark longitudinal stripe on maxillary often present. Length 62 mm.

Habitat: Pulu Weh (Sabang!); Nias!; Bali; Sumba!; Flores!; Timor!; Rotti!; Tiur!; Saleyer!; Kabaëna!; Salibabu!; Karakelang!; Savu!; Waigeu!; West New Guinea!. — Christmas Island, Philippines, Japan, Masthead Island (Queensland), Savay, Kandavu, Samoa.

Note. BLEEKER described *Pl. melas* in (1848) 1849 after a specimen of 54 mm. length from Bali. He mentions it again (1852) from Timor. But he unites it in 1853 (Nat. Tijdschr. Ned. Indië IV, 1853, p. 116) with *Pl. coeruleolineatus* Rüpp. = *Pl. nigricans* Rüpp. in the supposition, that in his badly preserved specimens from Bali the blue bands of the dorsal and anal had disappeared. BOULENGER (Cat. Perciform Fishes 1895, p. 340) also unites *Pl. melas* with *Pl. nigricans* Rüpp. But its validity is recognised by JORDAN & SEALE (v. s.), JORDAN & RICHARDSON (v. s.), T. REGAN (Proc. Zool. Soc. 1909, p. 403), SNYDER (v. s.), DE BEAUFORT (Bijdr. tot de Dierkunde, Amsterdam, 1913, p. 112) and by M. WEBER (v. s.). The lastnamed author has shown, that in *melas* the opercular ocellus, the dots on the scales are wanting independent of age, as BLEEKER supposed; they are also independent from sex. The original description of BLEEKER „corpore pinnisque omnibus nigerrimo maculis vel vittis nulla; membrana pinnae dorsalis spinosae parte superiore tantum pellucida", is, as also JORDAN & SEALE observe, diagnostic for *Pl. melas* Blkr. as also the formula of the dorsal XI. 8.

It is difficult to fix the distribution of *Pl. melas*, especially to the west; as it probably often is united with *nigricans* Rüpp., but we suppose, that the centre of its distribution lies in the eastern part of the indo-australian Archipelago, including the Philippines and farther eastward the pacific islands.

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4. Fam. PSEUDOPLESIOPIDAE.

Oblong, compressed; head and body covered with rather large cycloid scales. The single lateral line, constituted of scales with a not conspicuous sensory groove or pore, runs close to the dorsal fin and ends abruptly below its last rays; the lower lateral line of *Plesiops* is wanting. Mouth moderate, oblique, protractile, the jaws equal, the upper not reaching

behind eye. Operculum scaly and entire as also praeoperculum. Gillmembranes free from isthmus, but fused anteriorly; 6 branchiostegals; pseudobranchiae present; about 10 flat gill-rakers on horizontal branch of first arch. Upper jaw with small villiform teeth and 2 canines anteriorly; in the lower jaw an outer series of compressed, close set canines, differing in size, anteriorly a pair of large ones; besides an inner series of smaller ones. A ∧ formed band of villiform teeth on vomer; none on palatines and tongue. A single dorsal fin with 16 flexible simple rays and 9 to 10 soft rays, all united by an entire membrane and only slightly encreasing in height posteriorly. Anal of about equal form with 7 flexible simple rays and 9 soft rays. None of the simple rays are spinous, all are articulated. Caudal rounded. Pectorals short, rounded, with 16 rays. Ventrals somewhat before origin of pectorals, close together, with a weak spine and 4 unbranched rays, the first of which is elongate, incrassate and bifid.

1. **Pseudoplesiops** Bleeker.

(BLEEKER, Nat. Tijdschr. Ned. Indië XV, 1858, p. 217).

For characters of the single genus known see those of the family.

Distribution: that of the single species known.

Fig. 92. *Pseudoplesiops typus* Blkr. (After BLEEKER).

Note. This genus is rather doubtful as to its taxonomic position. BLEEKER placed it in 1875 next to *Plesiops* in his *Plesiopini*, a group of his family *Pseudochromidae*. But he draws already in 1858 the attention on some of its remarkable characters. In the first place on the fact, that none of the finrays are spinous, even not the first pelvic ray, which otherwise is the least flexible. It differs from *Pseudochromis* and *Plesiops* by the cycloid scales and the absence of palatine teeth.

Besides it differs from *Plesiops* by its dentition; but it resembles *Plesiops* in the construction of the ventrals, which have a weak spine and four rays, the first of which is thickened, produced and bifid, which was the reason that BLEEKER counted them as two and gives the formula of the ventrals I.5 for both *Plesiops* and *Pseudoplesiops*.

BOULENGER says about *Pleudoplesiops*: „This genus appears to combine characters of *Callanthias* and *Plesiops*. Its systematic position is, however, still very doubtful. C. TATE REGAN regards it as representative of a proper family *Pseudoplesiopidae*. He calls it an aberrant genus, that differs from the *Pseudochromidinae* in that the lower lateral line is absent, the dorsal and anal have but a single spine each, and the articulated rays of the pelvic fins are unbranched, 4 in number."

Study of one of the types of BLEEKER has shown us, that he is right, that none of the finrays is really spinous, the simple ones are all articulated.

1. **Pseudoplesiops typus** Blkr. [Fig. 92, pag. 380].

Pseudoplesiops typus Bleeker, Nat. Tijdschr. Ned. Indië XV, 1858, p. 217.
Pseudoplesiops typus Günther, Cat. Brit. Mus. II, 1860, p. 260.
Pseudoplesiops typus Bleeker, Verh. Akad. Amsterdam XV. 1875, p. 30.
Pseudoplesiops typus Boulenger, Cat. Brit. Mus. Perciform Fishes 1895, p. 336.

D. 9. 9—10; A. 1. 15; P. 16; V. 1.4; L.l. ca 36; L.tr. ca 16 [1]).

Oblong, compressed; height about $3^1/_3$ in length, about $4^1/_4$ in length with caudal; head somewhat pointed, about $3^1/_3$ in length, about $4^1/_2$ in length with caudal, slightly longer than high. Eyes about thrice in length of head, less than half their diameter distant; rostro-frontal line nearly straight; snout acute, much shorter than diameter of eye; anterior nostrils nearly unvisible, posterior approximated to orbits. Jaws equal, superior somewhat protractile, reaching to middle of eye, about $2^2/_3$ times in length of head. Teeth as described in family-diagnosis [2]). Lips fleshy. Praeoperculum with 4 transverse series of obliquely

1) Fin formula written according to the fact, that there are no true spines but instead only simple but articulated rays.

2) In the revised diagnosis of BLEEKER from 1875, the description of the dentition is incomplete and part of the good description of 1858 is omitted. The scales are in a preserved typical specimen, quoted below, distinguished by an uncommon marking, consisting of a central ring, from which radiate several lines towards the periphery.

placed scales, its border naked, its posterior margin rounded, undulate, entire; operculum without spine. The single lateral line runs near the dorsal profile and ends abruptly below the posterior simple dorsal rays, the scales being instructed with a slightly conspicuous small groove or pore. Dorsal and anal fins not divided, not scaly, anteriorly more, posteriorly less than twice lower than body; the undivided and divided rays flexible, their top filiform, united by a complete membrane, their height successively increasing posteriorly. Pectorals obtusely rounded, approximately not shorter than head without snout. Ventrals with a weak spine and all the rays simple, the 2 anterior thickened, much elongate, about equal to head. Caudal obtusely rounded, scarcely shorter than head. Colour of body and fins yellowish-roseate, orbits with a black ring. Length without caudal 460 mm. [The type of BLEEKER's collection in the Leiden Museum, in rather bad state, seen by us].

Habitat: Ambon; Goram; New Guinea (Doreh). — Chagos Archipelago. In sea.

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5. Fam. PRIACANTHIDAE.

Body strongly compressed, oblong or ovate, covered with small and thin or rather large, rough scales, their margin entire or denticulated. Lateral line complete, curved, the sensory tubes extending along the whole length of the scales. Head short, its postorbital part strongly abbreviated, densely covered with scales, which are ctenoid at least on snout and maxillaries. Mouth large, protractile, nearly vertical, with a prominent chin; maxillary without supplemental bone, exposed, not entirely slipping under the very narrow praeorbital, which is usually serrated. Praeoperculum entire or serrated; its angle with an indistinct or strong spine, or flat and crenulated. Operculum very narrow with one or more flat points. Gillmembranes separate, free from isthmus; gillrakers long or medium. Six branchiostegals; pseudobranchiae very extensive. More or less numerous rows of small conical, sometimes somewhat enlarged teeth on jaws, vomer and palatines; tongue smooth. Eyes very large; the posterior nostril close to them, very large and more or less slitlike. A single dorsal with 10 spines, depressible into a groove, and 11—15 rays. Anal with 3 strong spines

and 10—15 rays. Sometimes the spines and rays are serrated or striated. Caudal rounded (in young), truncate or emarginate. Pectorals small, rounded or pointed, with 18—20 rays, the upper longest. Ventrals very large, before origin of pectorals; close together, without an axillary scale, attached to belly by a membrane which incloses a groove, with a smooth or spinulated very strong spine and 5 rays.

Key to the indo-australian genera of Priacanthidae.

1. Oblong; scales throughout small with a sclerous rough ridge and entire margin; dorsal spines increasing in height posteriorly . . . . . *Priacanthus* p. 383.
2. Ovate; medio-lateral scales large, without a sclerous ridge, ctenoid; median dorsal spines the highest. . *Pseudopriacanthus* p. 390.

1. **Priacanthus** Cuvier.

(Cuvier, Règne Animal II, 1817, p. 284).

Strongly compressed, oblong, covered with small, thin scales, at some distance before their entire margin provided with a

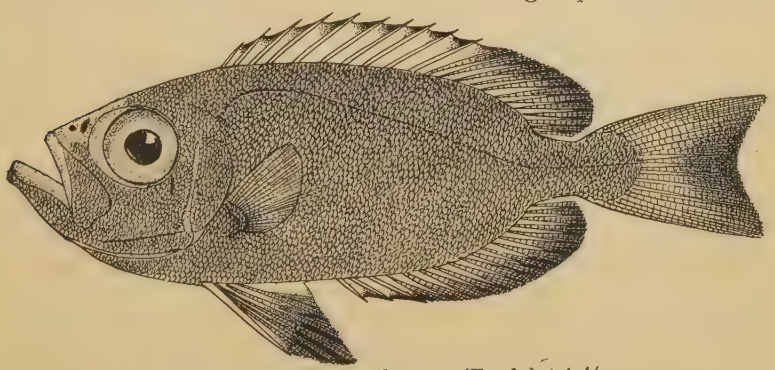

Fig. 93. *Priacanthus hamrur* (Forsk.) × 4/7.

rough, sclerous, small, plate-like ridge, better developed in the young. Lateral line ascending below anterior dorsal spines, than descending to middle of caudal peduncle. Head short, but longer than high, entirely scaly. Suborbital and praeoperculum finely serrated, its angle with a blunt or serrated praeopercular spine. Otherwise according to family diagnosis. Small or rather strong conical teeth in narrow band or in one or more series

on jaws, vomer and palatines; the tongue smooth. A single dorsal with 10 spines and 12—15 rays; anal with 3 spines and 13—15 rays; spinous and soft part of dorsal and anal continuous, evenly increasing in height posteriorly; the spines strongly or feebly spinulose. Caudal truncate or emarginate. Pectorals small, rounded. Ventrals long with a strong spine and 5 rays.

Distribution: Tropical and subtropical parts of Indic, Pacific and Atlantic.

Key to the indo-australian species of Priacanthus.

I. D. X. 14—15. A. III. 14—15. Spine at angle of praeoperculum short, indistinct in old specimens . . *P. hamrur* p. 384.

II. D. X. 12—13. A. III. 13—14. Spine at angle of praeoperculum strong.

A. Dorsal and ventral spines strongly spinulose. Ventrals equal to head without snout . . . . . *P. cruentatus* p. 386.

B. Dorsal and ventral spines feebly spinulose. Ventrals equal to head without lower jaw.

a. D. X. 12. Ventrals with distinct brown spots. *P. tayenus* p. 387.

b. D. X. 13. Ventrals without spots . . . . . *P. macracanthus* p. 388.

1. **Priacanthus hamrur** (Forsk.) [Fig. 93, p. 383].

Sciaena hamrur Forskål, Descript. Animalium 1775, p. 45.
Anthias macrophthalmus Bloch, Ausl. Fische VI. 1792, p. 115.
Anthias hamur Bloch Schneider, Syst. Ichth. 1801, p. 307.
Lutjanus hamrur Lacepède, Hist. Nat. Poissons IV. 1802, p. 178, 209.
Priacanthus hamruhr Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 104.
Priacanthus speculum Cuvier & Valenciennes, o. c. VII. 1831, p. 471.
Priacanthus hamrur Rüppell, Neue Wirbelthiere, Fische 1840, p. 95.
Priacanthus dubius Temminck & Schlegel, Fauna Japonica, Pisces 1844, p. 19.
Priacanthus japonicus? Bleeker, Nat. Tijdschr. Ned. Indie II. 1851, p. 171. (nec C.V.)
Priacanthus Blochii Bleeker, o. c. IV. 1853, p. 456.
Priacanthus blochii Günther, Cat. Brit. Mus. I. 1859, p. 218 (partim).
Priacanthus hamruhr Günther, l.c. p. 219 (partim).
Priacanthus speculum Playfair, Proc. Zool. Soc. 1867, p. 850.
Priacanthus hamrur Klunzinger, Abhandl. zool. bot. Ges. Wien XX. 1870, p. 708.
Priacanthus hamrur Bleeker, Ned. Tijdschr. Dierkunde IV. 1873, p. 176. — Atl. ichth. VII. 1873—1876, p. 13 (partim).
Priacanthus blochii Day, Fishes of India 4° 1875—1878, p. 48. Suppl. 1888, p. 783.
Priacanthus hamrur Steindachner & Döderlein, Denkschr. Akad. Wien XLVII. 1883, p. 239.
Priacanthus hamrur Klunzinger, Fische des Rothen Meeres I. 1884, p. 17.

Priacanthus hamrur Day, Fauna Brit. India, Fishes I. 1889, p. 482.
Priacanthus speculum Sauvage, Poissons de Madagascar, 1891, p. 117.
Priacanthus hamrur Boulenger, Cat. Perciform Fishes. 1895, p. 355.
Priacanthus hamrur Steindachner, Denkschr. math. naturw. Cl. Akad. Wien LXX. 1900, p. 484.
Priacanthus hamruhr Seale, Occas. Pap. B. P. Bish. Mus. IV, 1906, p. 38.
Priacanthus hamrur Evermann & Seale, Bull. Bureau Fisheries XXVI. (1906) 1907, p. 78.
Priacanthus hamrur Fowler & Bean, Proc. U. S. Nat. Mus. LXII. 1922, Art. 2, p. 27.

D. X. 14—15; A. III. 14—15; P. 2.16; V. I. 5; L.l. 80—90; L.tr. $\frac{9}{1}$ $\frac{}{38—45}$.

Oblong, dorsal and ventral profile evenly convex. Height 2.5—2.7, 3—3.6 in length with caudal. Head 2.7—3, 3.4—3.7 in length with caudal. Eye 2.2—2.7. Snout (without lower jaw) 3.3—4 in head. Interorbital space one half or two thirds of eye. Mouth very oblique. Lower jaw prominent. Maxillary reaching to below anterior half of eye, its width at posterior extremity about one half of eye. Conical teeth in narrow bands in jaws, on vomer and palatines. Tongue smooth. Lower and upper border of praeorbital and posterior and anterior border of praeoperculum finely serrated. A short blunt spine at praeopercular angle less than half of pupil, somewhat more developed in young specimens. First dorsal spine about half length of second, the following gradually increasing in length to the tenth, which is about equal to eye. Longest soft rays of dorsal about half diameter of eye longer than tenth dorsal spine. The origin of dorsal in the vertical through base of pectorals, that of anal below 7th or 8th dorsal spine. Third anal spine somewhat longer than second and not much less than diameter of eye. Dorsal and anal spines feebly spinulose in the young, mere striate in the adult; soft rays very feebly spinulose. Pectorals less than eye and snout, ventrals as long as head without lower jaw, their spine almost as long as eye and snout (without lower jaw). Caudal feebly crescentic. Least height of caudal peduncle almost twice in its length, equal to postorbital part of head. Colour of preserved specimens reddish brown above, more or less silvery below. Dorsal, anal, caudal and especially ventrals blackish towards the edge. Length 390 mm. [A specimen of BLEEKER's collection in the Museum of Amsterdam seen by us].

Nom. indig.: Sowangi (Menado); Gora-swangi, Saga-bini (Batjan).

Habitat: Pulu Weh!; Sumatra (Siboga, Tiku); Batu; Java (Batavia); Celebes (Menado); Sangir; Ternate; Batjan; Buru; Ambon!; Aru islands; New Guinea. — East coast of Africa, Red Sea to China, Japan and eastwards to Hawaiian islands.

2. Priacanthus cruentatus (Lac.)

Labrus cruentatus Lacepède, Hist. Nat. Poissons III. 1802, p. 522.
Priacanthus carolinus Lesson, Voyage Coquille, 1826, p. 224.
Priacanthus macrophthalmus Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 97 (partim).
Priacanthus cruentatus Cuvier & Valenciennes, l. c. p. 102 (partim).
Priacanthus boops Cuvier & Valenciennes, l. c. p. 103 (partim).
Priacanthus carolinus Cuvier & Valenciennes, l. c. p. 105.
Priacanthus carolinus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 235.
Priacanthus Boops Peters, Monatsber. Akad. Berlin 1855, p. 431.
Priacanthus macrophthalmus Günther, Cat. Brit. Mus. I. 1859, p. 215 (partim).
Priacanthus blochii Günther, l. c. p. 218 (partim, nec Blkr.).
Priacanthus carolinus Bleeker, Ned. Tijdschr. Dierk. IV. (1871) 1872, p. 174. — Atl. ichth. VII. 1873—1876, p. 13.
Priacanthus carolinus Günther, Fische der Südsee V. 1873—1875, p. 17.
? *Priacanthus Schlegelii* Hilgendorf, Sitzber. Ges. naturf. Freunde 1879, p. 79.
Priacanthus carolinus Sauvage, Poissons Madagascar 1891, p. 121.
Priacanthus cruentatus Boulenger, Cat. Perciform Fishes I. 1895, p. 352.
Priacanthus cruentatus Jordan & Evermann, Fishes North and Middle America I, 1896, p. 1238.
Priacanthus carolinus Jordan & Evermann, l.c. III. 1898, p. 2858.
Priacanthus cruentatus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII. (1903) 1905, p. 229.
Priacanthus cruentatus Steindachner, Sitzb. mathem.-naturw. Cl. Akad. Wien CXV. Abt. I, 1906, p. 1378.
Priacanthus cruentatus Jordan & Seale, Bull. Bur. Fish. XXVI. (1906) 1907, p. 20.
Priacanthus cruentatus Gilchrist & Thompson, Ann. South Afric. Mus. VI. Prt. 2. 1908, p. 147.

D. X. 12—13; A. III. 14; P. 2.15—17; V. I. 5; Sc. about 90; L.l. about 70; L.tr. $\frac{8—9}{1}$.
$\frac{}{55}$

Oblong. Height 2.7—2.8, 3.3—3.4 in length with caudal. Head 3—3.2, 3.6—3.7 in length with caudal. Eye 2.4—2.6. Snout (without the lower jaw) a little less than one third of head and slightly more than interorbital space. Mouth very oblique. Lower jaw prominent. Maxillary reaching a little farther back than frontborder of eye; its width at posterior

extremity about one third of eye. Lower and upper border of praeorbital and posterior and inferior border of praeoperculum finely serrated. A strong flat serrated spine at praeopercular angle, one third to one fifth diameter of eye. Conical teeth in a few series in jaws, on vomer and palatines. Tongue smooth. Origin of dorsal in vertical through base of pectorals. First dorsal spine about half length of second. Fourth to tenth spine subequal, the last 1.6 to 2 times as long as second and about equal to diameter of eye. Longest soft rays not much longer than longest spines. Spines strongly spinulous, soft rays, with distant small spines. Origin of anal below seventh dorsal spine. Anal spines smooth, the third one slightly spinulous at tip, longer than the others and about equal to eye. Anal ending somewhat farther back than dorsal; both fins rounded behind. Pectorals shorter than eye and snout, ventrals reaching anal, as long as head without snout, their spine strongly spinulose. Caudal truncate or feebly rounded. Least height of caudal peduncle about twice in its length, about equal to snout (without lower jaw). Colour of preserved specimens brownish above (red in live), lighter and silvery on the sides and belly. Soft dorsal, anal and caudal with darkish round spots, upper margin of spinous part of dorsal darkish. Length over 290 mm.

Habitat: Pulu Weh!; Binongka!; Ceram; Ambon; Banda. — Tropical and subtropical Atlantic, Pacific and Indic. In sea.

3. **Priacanthus tayenus** Rich.

Priacanthus tayenus Richardson, Rep. Ichth. China, Rep. 15th meeting Brit. Assoc. (1845) 1846, p. 237.
Priacanthus holocentrum Bleeker, Verh. Bat. Gen. XXII. 1849, Percoiden, p. 48.
Priacanthus Schmittii Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 572.
Priacanthus holocentrum Günther, Cat. Brit. Mus. I. 1859, p. 220.
Priacanthus tayenus Günther, l. c. p. 221.
Priacanthus holocentrum Steindachner, Ichth. Mitth. I Abhandl. zool. bot. Gesellsch. Wien XI. 1861, p. 76.
Priacanthus tayenus Bleeker, Ned. Tijdschr. Dierk. IV. (1871) 1872, p. 172. — Atl. ichth. VII. 1873—1876, p. 12.
Priacanthus holocentrum Day, Fishes of India 4°, Suppl. 1888, p. 783. — Fauna of Brit. India, Fishes I. 1889, p. 482.
Priacanthus tayenus Boulenger, Cat. Perciform Fishes 1895, p. 355.
Priacanthus tayenus Fowler & Bean, Proc. U. S. Nat. Mus. vol. LXII. 1922, Art. 2, p. 26.

D. X. 12; A. III. 13; P. 2.15; V. I. 5; L.l. about 65; L.tr. $\frac{8}{1}$.
$\frac{}{35}$

Somewhat elongate. Height about 3, 3,8 in length with caudal. Head 2.8, 3.7 in length with caudal. Eye 2.5. Snout (without lower jaw) three fifths of eye, interorbital space a little less than half eye. Mouth very oblique, lower jaw prominent. Maxillary reaching to below anterior part of eye, its width at posterior extremity one half of eye. Rather strong pointed teeth in a few rows in upper jaw, some of those near symphysis enlarged. Lower jaw with a single row of conical, somewhat curved teeth. A triangular patch of teeth on vomer, and rather smaller teeth in a single row on palatines. Praeorbital distinctly serrated along its upper and lower border. Praeoperculum serrated behind and below. A strong serrated spine, as long as pupil, at praeopercular angle. Origin of dorsal above base of pectorals. Dorsal spines gradually increasing in length posteriorly, the tenth somewhat longer than eye. Longest soft dorsal rays equal to longest anal ones and to eye and snout (without lower jaw). First anal spine not much shorter than second one, third one much stronger and longer, equal to eye. Dorsal spines feebly, anal spines distinctly serrated. Origin of anal in vertical through seventh dorsal spine. Pectorals half as long as ventrals, which are equal to head without lower jaw. Ventral spine feebly spinulose. Caudal crescentic, with the lobes produced. Least height of caudal peduncle about twice in its length and equal to postorbital part of head. Colour of preserved specimens light reddish above, silvery below. Fins hyaline. Ventrals with brown spots, those on the membrane between fifth and fourth ray largest. A still larger brown spot on membrane connecting ventral to belly. Length 250 mm. [A specimen of BLEEKER's collection in the Zoological Museum of Amsterdam seen by us].

Nom. indig.: Siriding-tombakko (Javanese Bantam). Tommongong (Malay Batavia).

Habitat. Singapore; Sumatra (Padang); Banka; Java (Batavia. Tjiringin, Bantam); Celebes (Makassar); Ambon. — Madras, China, Formosa, Philippines. — In sea.

4. Priacanthus macracanthus C.V.

Priacanthus macracanthus Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 108.

? *Priacanthus fax* Cuvier & Valenciennes, o. c. VII. 1831, p. 473.
Priacanthus benmebari Temminck & Schlegel, Fauna Japonica, Pisces 1844, p. 19.
Priacanthus macracanthus Bleeker, Verh. Bat. Gen. XXII. 1849, Percoiden p. 48.
Priacanthus benmebari Günther, Cat. Brit. Mus. I. 1859, p. 218.
Priacanthus macracanthus Günther, l. c. p. 220.
Priacanthus Benmebari Günther, Ann. Mag. Nat. Hist. (3) XX. 1867, p. 57.
Priacanthus bleekeri Castelnau, Proc. Zool. Soc. Victoria 1873, p. 100.
Priacanthus hamruhr Bleeker, Atl. ichth. VII. 1873—1876, p. 13 (partim).
Priacanthus benmebari Bleeker, Verh. Akad. Amsterdam XVIII. 1878, Poissons Japon. p. 5.
Priacanthus macracanthus Castelnau, Proc. Linn. Soc. N. S. Wales III. 1879, p. 369.
Priacanthus benmebari Macleay, Descr. Cat. Austr. Fish. I. 1881, p. 37.
? *Priacanthus junonis* De Vis, Proc. Linn. Soc. N.S. Wales IX. 1884, p. 392.
Priacanthus hamrur Sauvage, Poissons de Madagascar 1891, p. 125 (nec Forsk.)
? *Priacanthus fax* Sauvage, l. c. p. 126.
Priacanthus macracanthus Boulenger, Cat. Perciform Fishes I. 1895, p. 354.
? *Priacanthus fax* Alcock, Journ. Asiat. Soc. Bengal LXV. 1896, p. 311.
Priacanthus macracanthus Jordan & Thompson, Proc. U. S. Nat. Mus. XLI. 1912, p. 530.
Priacanthus macracanthus Mc Culloch, Checklist of fish. etc. of N. S. Wales Prt. II. 1919, p. 49.
Priacanthus macracanthus Fowler & Bean, Proc. U. S. Nat. Mus. LXII. 1922, Art. 2, p. 27.

D. X. 13; A. X. 13 (14); P. 2.15; V. I. 5; L.l. 68—83; L.tr. $\frac{9}{1}$. $\frac{}{40}$

Oblong. Height about equal to head, about 3 in length, 3.4—3.5 in length with caudal. Eye 2.6—2.7, slightly more than snout. Interorbital space 1.7 in eye. Mouth very oblique, maxillary reaching a little farther than frontborder of eye. Lower jaw prominent. Praeorbital finely serrated below. Praeoperculum finely serrated posteriorly and inferiorly, the serrations of the inferior limb more distinct. A strong spinulose spine at praeopercular edge, about one third of eye. Conical teeth in two rows in upper jaw, some of those of the inner row near symphysis enlarged. Somewhat stouter teeth in a single row in lower jaw. Teeth on vomer and palatines in a single row. Tongue smooth. Origin of dorsal above base of pectorals. Spines feeble, scarcely rugose, the first about three thirds of the second. Spines gradually but slightly increasing in size posteriorly, the tenth equal to eye or somewhat longer, equal to third anal spine, which is longer but less thick than second anal spine. Anal spines perhaps somewhat more rugose than dorsal spines. Origin of anal below 8th dorsal spine. Soft part of dorsal and anal rounded. Anal ending slightly behind dorsal.

Pectorals half length of head, ventrals as long as head without lower jaw, their spine feebly spinulose, equal to head without snout. Caudal truncate. Least height of caudal peduncle twice in its length, equal to postorbital part of head. Colour of preserved specimen light reddish brown. Dorsal, anal, caudal and ventrals blackish near edge, and with indistinct darkish irregular spots. Length 320 mm.

Habitat: Nias!; Java (Batavia); North Celebes; Ambon; Banda; Arafura sea. — From Japan, China, Philippines to tropical part of Australia.

2. Pseudopriacanthus Bleeker.

(Bleeker, Versl. Akad. Amsterdam (2) III. 1869, p. 241).
Priacanthus Cuvier & Valenciennes, Poissons IV. 1829, p. 96 (p.p.).

Strongly compressed, ovate. Scales on dorsal and ventral parts of body small, on middle of sides large, striated, rough, without an intramarginal platelike ridge, their margin strongly ctenoid. Lateral line strongly curvate, its top situated below the 4th or 5th dorsal spine, thence descending to middle of caudal peduncle. Head very short, slightly higher than long; entirely covered by small rough scales including maxillary, mandible, gular and branchiostegal membranes. Praeoperculum serrate. Operculum generally without a spine. Villiform teeth on jaws, vomer and palatines, the outer ones in upper jaw may be more or less enlarged. Dorsal X. 11—12, anal III. 9—11; in a sheath. Spinous dorsal high, the median spines are the longest. Caudal in young rounded, later truncate or slightly emarginate. Otherwise essentially as in *Priacanthus*.

Distribution: Indic, West-Pacific, West Indies, Southern Atlantic, coast of North America.

1. Pseudopriacanthus niphonius (C.V.)

Priacanthus niphonius Cuvier & Valenciennes, Hist. Nat. Poissons III. 1829, p. 107.
Priacanthus niphonius Temminck & Schlegel, Fauna Japonica, Pisces, 1844, p. 21.
Priacanthus niphonius Günther, Cat. Brit. Mus. I. 1859, p. 217.
Priacanthus niphonius Bleeker, Acta Soc. Sc. Ind. Neerl. VIII. 1860, Vischf. Japan, p. 73.
Myripristis refulgens Valenciennes, Compt. rend. Ac. Science LIV. 1862, p. 1169.
Pseudopriacanthus niphonius Bleeker, Versl. Akad. Amsterdam (2) III. 1869, p. 241.
Priacanthus meyeri Günther, Proc. Zool. Soc. 1871, p. 656.
Pseudopriacanthus niphonius Bleeker, Ned. Tijdschr. Dierk. IV. 1872, p. 239. — Atl. ichth. VII. 1873—1876, p. 14.

Priacanthus Meyeri Sauvage, Bull. Soc. Philom. (7) VI. 1882, p. 168.
Priacanthus (Pseudopriacanthus) niphonius Steindachner & Döderlein, Denkschr. Akad. Wien XLVII. 1883, p. 239.
Priacanthus refulgens Sauvage, Poissons de Madagascar, 1891, p. 129.
Priacanthus meyeri Sauvage l.c. p. 131.
Pseudopriacanthus niphonius Boulenger, Cat. Perciform Fishes I. 1895, p. 358.

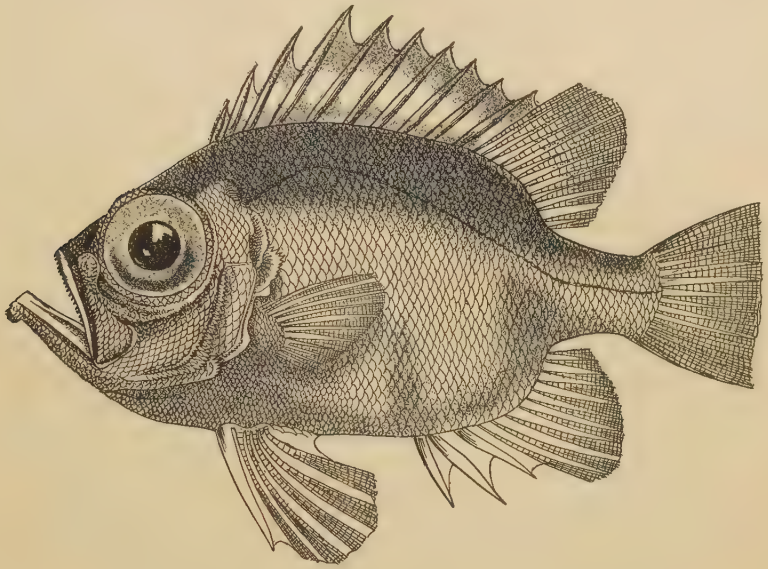

Fig. 94. *Pseudopriacanthus niphonius* (C.V.) After Bleeker.

Pseudopriacanthus niphonius Smith & Pope, Proc. U.S. Nat. Mus. XXXI. 1906, p. 474.
Pseudopriacanthus niphonius Franz, Abh. II. Kl. K. Akad. Wiss. München IV. Suppl. Bd. I, 1910, p. 40.
Pseudopriacanthus niphonius Jordan & Thompson, Proc. U. S. Nat. Mus. XLI. 1912, p. 534.

D. X. 11; A. III. 10; P. 2.16; V. I. 5; L.l. 46; L.tr. $\frac{5}{33}$.

Height 1.8, 2.1—2.3 in length with caudal. Head 2.3—2.5, 2.9—3 in length with caudal. Eye 1.9—2.3. Snout, without lower jaw, scarcely more than interorbital space, which is half diameter of eye. Mouth very oblique, maxillary reaching to below anterior half of eye. Lower jaw the longer, chin prominent. Praeoperculum strongly denticulated, with a spine at angle in young specimens, but absent in older ones. Dorsal originating above base of pectorals. Spines strong and grooved or striated, the middle ones longest and equal to eye and

snout. Second and third anal spines nearly equal, as long as tenth dorsal spine. Pectorals a little shorter than eye and snout. Ventrals equal to head without lower jaw. Caudal slightly rounded. Least height of caudal peduncle a little less than its length and equal to two thirds of eye. Reddish above, silvery below, the soft fins edged with blackish, young with dark cross bands. Length 275 mm. [Specimens of BLEEKER's collection from Japan in the Leiden Museum, seen by us].

Habitat: Celebes (Menado). — Japan, Islands Réunion and Bourbon. — In sea.

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6. Fam. CENTROPOMIDAE.

Body compressed, elongate or oblong with elevated back and depressed or pointed head. Scales usually moderate or large, adherent or deciduous, cycloid or finely or conspicuously denticulated. Lateral line complete, extending to base or nearly to end of caudal, continuous or by exeption interrupted, the sensory tubes occupying the basal half of the exposed part of the scales. Head totally or partly scaled. Mouth large or moderate, horizontal or oblique, moderately protractile; jaws equal or lower jaw with a prominent chin. Maxillary totally exposed, not slipping under the praeorbital; a supplemental bone present or absent. Praeoperculum with a single posterior serrated border or with two ridges, inferiorly serrated or spinous. Operculum with or without a spine. Gillmembranes separate; 7 branchiostegals; pseudobranchiae small or absent; gillrakers long. Teeth acute or granular, in narrow or villiform bands on jaws, vomer, palatines and ectopterygoids, those on tongue may be wanting. By exception the outer series of teeth in jaws may be enlarged and caniniform. Dorsal fins separated or connected at their base, subequal, the spinous portion with 7—9 strong spines, the soft portion with one spine and 9—15 rays. A recumbent spine in front of dorsal, directed forward, may be present. Anal short with 3 spines and 6—17 rays. Caudal rounded or forked. Pectorals rather broad and obtusely pointed, or narrow and narrowly pointed. Ventrals close together with or without a scaly axillary process, situated below or somewhat behind origin of pectorals, with a strong spine and 5 rays. 24 or 25 (10—12+13—15) vertebrae; an occipital, in some

genera also a parietal crest present. The genus *Ambassis* has muciferous channels in the frontals.

Carnivorous marine fishes of small or medium size, some entering also fresh water or are restricted to it.

Key to the indo-australian genera of Centropomidae.

I. Ventrals with a scaly axillary process; scales ctenoid; praeoperculum with a single edge, serrated posteriorly; frontals without muciferous channels; parietal and occipital crests; a supplemental maxillary bone. Caudal rounded.
  A. Maxillary reaching to below eye. Nostrils far distant. Inferior border of praeoperculum entire. A patch of teeth on tongue . . . . . *Psammoperca* p. 393.
  B. Maxillary reaching behind eye. Nostrils approximate. Inferior border of praeoperculum spinous. Lingual teeth rudimentary or none . . . . . *Lates* p. 395.

II. Ventrals without a scaly axillary process; scales cycloid; praeoperculum with a double ridge, the lower limb of which is serrated or spinous; frontals with muciferous channels; occipital crests only; a supplemental maxillary bone wanting. Caudal furcate . . . . . *Ambassis* p. 398.

Doubtful genus: . . . . . *Tetracentrum* p. 424.

1. Psammoperca Richardson.

(Richardson, Zoology Erebus & Terror, Fish. 1846, p. 115).
Cnidon Müller & Troschel, Horae ichth. III. 1849, p. 21.

Body subelongate, back elevated, head pointed, dorsally and laterally scaled, snout without scales, the nostrils very distant. Mouth moderate, protractile, horizontal, the jaws equal, maxillary reaching to below eye. Posterior border of praeoperculum serrated, inferior border entire, a strong spine at angle. Operculum ending in a small spine. Granular teeth on jaws, vomer, palatines and ectopterygoids and a patch on posterior part of tongue. The spinous and soft portion of dorsal connected at their base; the former with 7 spines, the latter with one spine and 12—15 rays; anal short with 3 spines and 9 to 13 rays. Both fins in a basal scaly sheath, their soft portion covered with scales. Caudal rounded. Pectorals rounded, with 16 rays; above and slightly before ventrals, which have a strong spine and 5 rays. 25 vertebrae; head with occipital and parietal crests.

Distribution: Coastal fishes from the Bay of Bengal to Northern Australia and the China Sea.

1. **Psammoperca waigiensis** (C.V.) [Fig. 95, p. 394].

Labrax waigiensis Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 83.
Psammoperca datnioides Richardson, Zool. Voyage Erebus & Terror, Fish. 1846, p. 116.
Cnidon chinensis Müller & Troschel, Horae Ichth. III. 1849, p. 21.
Labrax waigiensis Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 478.
Psammoperca waigiensis Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 177.
Psammoperca waigiensis Günther, Cat. Brit. Mus. I. 1859, p. 69.
Psammoperca waigiensis Kner, Novara Exp. Fische 1865—1867, p. 13.
Psammoperca waigiensis Günther, Ann. Mag. Nat. Hist. (4) X. 1872, p. 427.

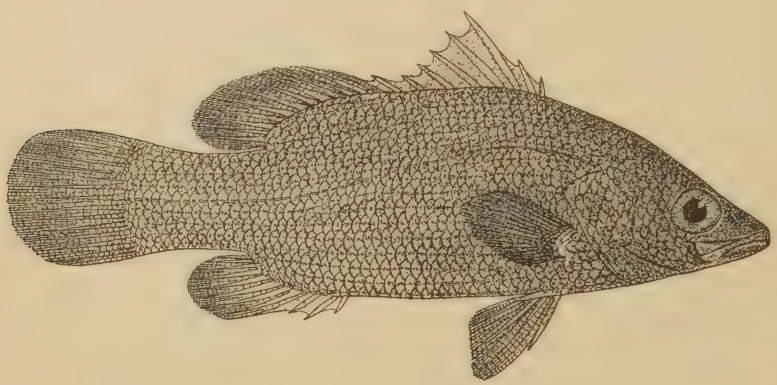

Fig. 95. *Psammoperca waigiensis* (C.V.) × $^1/_2$.

Psammoperca Waigiensis Macleay, Descr. Cat. Austral. Fish I. 1881, p. 7.
Psammoperca waigiensis Day, Fauna of British India, Fishes I. 1889, p. 440, footnote.
Psammoperca vaigiensis Boulenger, Cat. Perciform Fishes 1895, p. 365.
Psammoperca waigiensis Jordan & Evermann, Proc. U.S. Nat. Mus. XXV. 1902, p. 340
Psammoperca waigiensis McCulloch, Rec. W. Austr. Mus. I. 1913, p. 215.

D^1 VII; D^2 I. 12; A. III. 8; P. 2.14—15; V. I. 5; L.l. 45—50; Ltr. $\frac{5\frac{1}{2}}{11}$.

Dorsal profile slightly arched, somewhat concave before eyes. Height 2.6—3.1, 3.3—3.8 in length with caudal. Head 2.8—3, 3.6—3.7 in length with caudal. Eye 4.1—4.6, a little less than snout and somewhat more than convex interorbital space. Mouth slightly oblique. Jaws equal. Maxillary reaching to below posterior border of pupil or somewhat farther, the width of its distal extremity one half or two thirds of eye.

Small crowded granular teeth in bands in jaws and on palatines; in a triangular patch on vomer. Teeth on tongue. Praeorbital smooth. Praeoperculum finely serrated posteriorly, smooth inferiorly. A strong spine at angle of praeopercular ridge. Opercular spine weaker. Snout naked, cheeks with about 15 rows of scales, the lower series smaller than the upper ones. Scales from occiput extending forward to between eyes. Opercles with large scales. First dorsal spine small, half length of second, which is equal to or somewhat longer than eye. Third spine equal to half length of head or somewhat shorter, slightly longer than fourth one, which is generally as strong and sometimes even stronger than third one. Spine of second dorsal equal to sixth spine of first dorsal. Base of second dorsal, which is rounded, as long as that of first dorsal; the longest soft rays about as long as third spine of first dorsal. First anal spine somewhat more than half length of second, which is equal to third one and to diameter of eye. Anal rounded, its origin below beginning of second fourth of second dorsal, its end somewhat farther back than that of second dorsal. Pectorals somewhat shorter than ventrals, equal to or somewhat more than postorbital part of head. Ventral spine as long as snout or somewhat longer. Caudal rounded. Least height of caudal peduncle equal to its length and to postorbital part of head. Colour of preserved specimens reddish brown, with silvery reflections on sides of head and belly. Fins reddish brown, ventrals more blackish in their distal part. Length 320 mm.

Habitat: Singapore; Bintang; Banka; Billiton; Java (Batavia); Madura; Borneo (Sandakan); Celebes (Makassar!, North Celebes); Rotti!; Kei islands!; Aru islands!; Waigeu; New Guinea (Gulf of Papua). — From Madras to China, Philippines and North Australia.

2. Lates Cuvier & Valenciennes.

(Cuvier & Valenciennes, Hist. Nat. Poissons II, 1828, p. 88).

Body compressed, oblong-elongate, dorsally elevated; head depressed, pointed, only its vertex and sides scaly. Mouth very wide, horizontal, maxillary reaching behind eye; lower jaw projecting. Posterior border of praeoperculum serrated, the inferior border with a few spines directed downwards, a strong spine at the angle. Operculum ending in a spine. Villiform

teeth on jaws, vomer, palatines and ectopterygoids, on tongue rudimentary or none. The spinous and soft dorsal continuous or connected at their base; the former with 7 to 8 spines, the latter with 1 spine and 10—12 rays; anal with 3 short

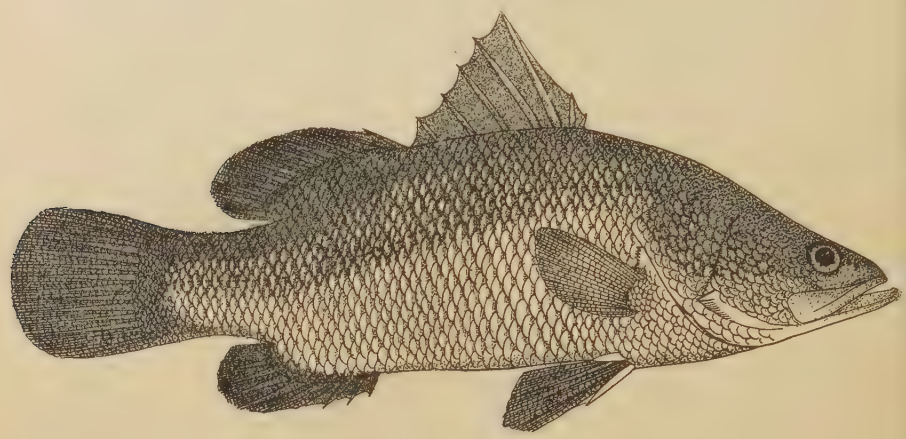

Fig. 96. *Lates calcarifer* (Bl.) × 2/3.

spines and 8—9 rays. Both fins in a basal scaly sheath, their soft portions covered with scales. Pectorals short, rounded with 16 or 17 rays, situated slightly before ventrals which have a strong spine and 5 rays. Caudal rounded. 25 vertebrae, head with occipital and parietal crests.

Distribution: The indo-australian Archipelago, coasts of India, North Australia and Southern China, entering also mouths of rivers in Nile, Niger and Senegal.

1. **Lates calcarifer** (Bl.) [Fig. 96, p. 396.]

Holocentrus calcarifer Bloch, Ausl. Fische IV. 1790, p. 100.
Perca calcar Bloch Schneider, Syst. Ichth. I. 1801, p. 89.
Holocentrus heptadactylus Lacepède, Hist. Nat. Poissons IV. 1802, p. 344.
Coius vacti Hamilton Buchanan, Fishes Ganges 1822, p. 86.
Lates nobilis Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 96.
Lates calcarifer Cuvier & Valenciennes, l. c. p. 100.
Lates nobilis Bleeker, Verh. Bat. Gen. XXII. 1849, Percoïden p. 27.
Lates heptadactylus Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 983.
Lates calcarifer Günther, Cat. Brit. Mus. I. 1859, p. 68. — Proc. Zool. Soc. 1870, p. 824.
Lates calcarifer Day, Fishes of India 4°, 1875—1878, p. 7, Suppl. 1888, p. 779.
Plectropoma calcarifer Bleeker, Atl. ichth. VII. 1873—1876, p. 109.
Lates Darwiniensis Macleay, Proc. Linn. Soc. N. S. Wales V. 1878, p. 345.
Lates calcarifer Vinciguerra, Ann. Mus. Civ. Genova 1890, p. 162.

Lates calcarifer Boulenger, Cat. Perciform Fishes I. 1895, p. 363.
Lates calcarifer Sundara Raj, Rec. Ind. Mus. XII. Prt. VI. 1916, p. 278.

D^1 VII—VIII; D^2 I. 10—11; A. III. 7—8; P. 2.15; V. I. 5; L.l. 52—61; L.tr. $\frac{5\frac{1}{2}—6}{1 \over 13}$.

Oblong. Upper profile of head more or less concave. Height 3—3.1, 3.6—3.7 in length with caudal. Head 2.7—2.8, 3.3—3.4 in length with caudal. Eye 6.4—7.7 (according to size of fish), 1.2—1.9 in snout. Interorbital space convex, 1.2—1.7 in eye. Mouth somewhat oblique. Lower jaw projecting. Maxillary reaching beyond vertical through hindborder of eye, the width of its distal extremity equal to or three fourths of eye. Bands of villiform teeth in the jaws; in a triangular patch on vomer and in narrow elongate patches on palatines, which are pointed posteriorly and continuous with the elongate patch on ectopterygoids. No teeth on tongue. Praeorbital more or less serrated or crenulated; praeopercular border forming an obtuse angle, finely serrated posteriorly, with three to four distant spines along its lower border and with a still stronger spine at its angle. Opercular spine flat. About 15 rows of scales on cheeks. Opercle scaly. First dorsal spine minute, second one double of first and one third or less of third spine, which is stronger and longer than the others and about half length of head. Spine of second dorsal about equal to sixth one of first dorsal. Second dorsal rounded, less high than first dorsal. First anal spine very small, second one equal to diameter of eye and two thirds of third anal spine. Anal fin rounded, its origin below beginning of second third of second dorsal, and ending somewhat beyond vertical through end of that fin. Pectorals somewhat shorter than ventrals, a little more or less than half length of head. Ventral spine equal to eye and snout. Caudal rounded. Least height of caudal peduncle about 1.2 in its length and 2.5 in length of head. Colour of preserved specimens light brown above, silvery below. Fins more or less darkish, especially anal and caudal. Ventrals dusky in their distal part. Length 1700 mm.

Nomen indig.: Kakap (Malay); Telah, Tetehan (Javan.) Tjateh, Tekkong, Dubit (Madurese).

Habitat: Singapore; Banka; Java (Batavia, Bantam, Cheribon, Tegal, Semarang, Japara, Rembang, Surabaya!, Grissee, Pasuruan, Besuki, Tjilatjap); Borneo (Pamangkat,

Baram river, Sandakan); Madura; Sumbawa; Flores!; Celebes (Makassar!, North Celebes); New Guinea (Lorentz river!). — From Persian Gulf, to Southern China, Philippines and North Australia. In sea, tidal waters and rivers. A much esteemed food fish.

3. Ambassis Cuvier & Valenciennes.

(Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 175).

Chanda Hamilton Buchanan, Fishes Ganges 1822, p. 103, 370.
Parambassis Bleeker, Nat. Verh. Holl. Maatsch. Haarlem, 3. Verz. II. (1873) 1874. Révis. Ambassis, p. 102.
Pseudambassis Bleeker, Arch. Néerl. Sc. Nat. XI, 1876, p. 292.

Body oblong or oblong-ovate, covered with large or small, rather deciduous, cycloid scales. Lateral line complete, continuous or interrupted. Head scaly only on vertex, cheeks and opercular apparatus. Gape of mouth moderate, usually oblique, only slightly protractile, jaws equal or the lower one the longer or by exception included. Praeoperculum with a double edge, the lower limb of which is serrated or spinous; operculum without a prominent spine. Gillmembranes separate; 6 branchiostegals; pseudobranchiae present. Teeth in jaws in villiform bands or acute in several series, the outer of which occasionally may be larger, even canines; narrow bands of teeth on vomer and palatines, lingual teeth may be wanting. Spinous and soft portion of dorsal fin connected at their base. The former with 7 spines and with a recumbent spine, pointing forwards; the latter with one spine and 8—17 rays. Anal with 3 strong spines and 8—18 rays. Both fins in a scaly basal sheath. Caudal forked. Pectorals rounded. Ventrals below or before origin of pectorals and with one spine and 5 rays, without a scaly axillary process. Frontals with strongly developed muciferous channels, an occipital crest present; 24 vertebrae.

Distribution: In sea, brackish and fresh water of the Indo-pacific Region.

Key to the indo-australian species of Ambassis.

I. Lower jaw the longer. Chin prominent. L.l. 25—46.
  A. L.l. 39—46. Five to six rows of scales above l.l., which is continuous. Second anal spine longer than third one.

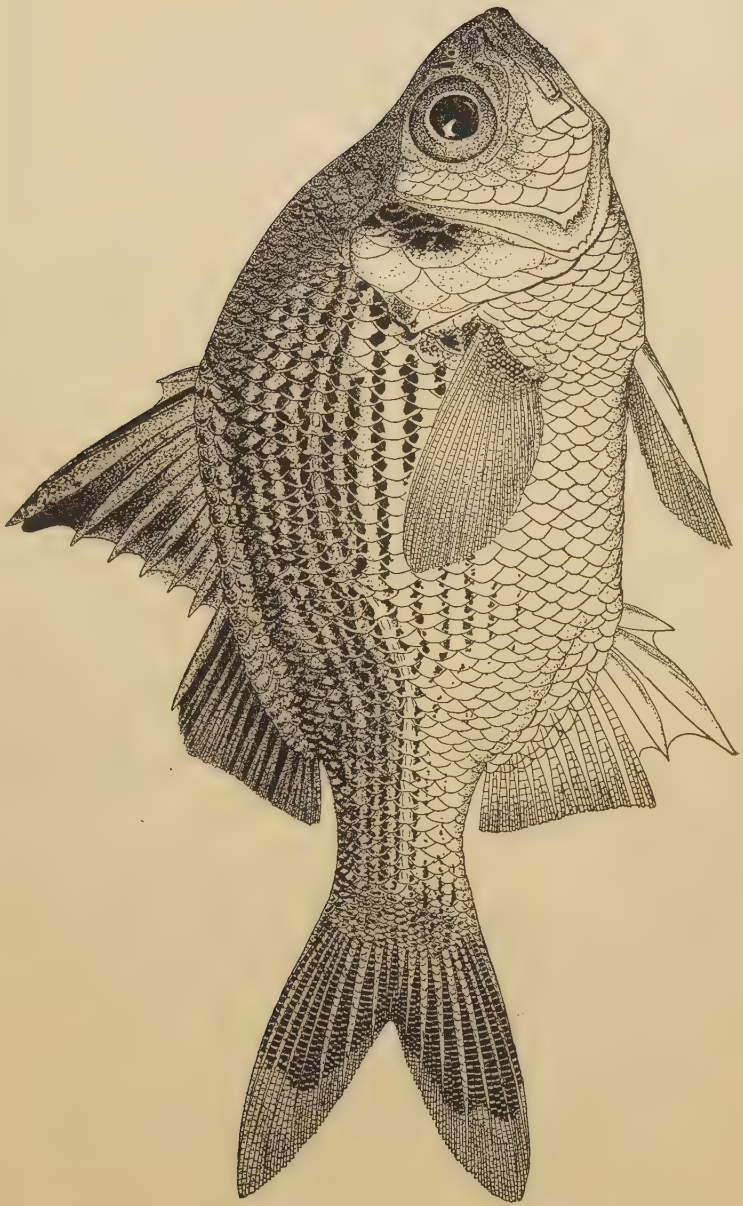

Fig. 97. *Ambassis gigas* Rams. & Ogilby × 0.7.

1. L.l. 43—46. No bands on body . . . . 1. *A. wolffi* p. 401.
2. L.l. 39—40. Body with numerous longitudinal dark bands . . . . . 2. *A. gigas* p. 403.

B. L.l. 25—30. Two to three rows of scales above l.l., which is continuous or interrupted. Second anal spine as long as or shorter than third one.

1. Dorsal separated by 8—9 scales from occiput.
   a. Teeth on tongue. Each caudal lobe with a longitudinal dark band . . . 3. *A. urotaenia* p. 404.
   b. No teeth on tongue. Tip of spinous part of dorsal deep black . . . . . 4. *A. kopsi* p. 405.
2. Dorsal separated by 11—22 scales from occiput.
   a. Lateral line continuous, gently curved.
      α. 17—22 scales before dorsal. Teeth on tongue. Maxillary somewhat delated posteriorly, with the hind-border a little emarginate . . . . 5. *A. commersoni* p. 406.
      β. 13—16 scales before dorsal. Teeth on tongue. Maxillary not delated posteriorly, obliquely truncate behind . . . . . 6. *miops* p. 408.
      γ. 11—13 scales before dorsal. No teeth on tongue. Maxillary delated posteriorly, truncate at right angles, with rounded corners . . . . . 7. *A. nalua* p. 409.
   b. Lateral line interrupted, or, if continuous, with an abrupt curve down.
      1. Lateral line visible on foremost scale only . . . . . 8. *A. agrammus* p. 411.
      2. Lateral line more developed.
         a'. Maxillary reaching to below anterior border of pupil. Teeth on tongue. Lateral line continuous or interrupted by one scale only . . . . . 9. *A. buton* p. 411.
         b'. Maxillary shorter, reaching to below frontborder of eye.
            α. Supraorbital ridge with three to five spines posteriorly.

Height 2.8—3.3. Ltr. $\frac{2-2\frac{1}{2}}{\frac{1}{7-8}}$. 10. *A. gymnocephalus* p. 412.

β. Supraorbital ridge with a single spine posteriorly.

α′. Interoperculum with 6—13 serrations. Height 2—2.3.

a″. L. tr. $\frac{2\frac{1}{2}-3}{\frac{1}{10}}$. Body with a reticulate pattern of dark brown . 11. *A. reticulata* p. 414.

b″. L.tr. $\frac{2\frac{1}{2}-3\frac{1}{2}}{\frac{1}{7\frac{1}{2}-8}}$. Body without reticulate pattern . . . . . 12. *A. interrupta* p. 415.

β′. Interoperculum smooth or with a single spine. Height 2.3—2.7 . . . . . 13. *A. buruensis* p. 417.

II. Upper jaw the longer or jaws equal. Outer row of teeth on upper jaw enlarged. L.l. 37—59. (*Parambassis*).

a. Four rows of scales between l.l. and dorsal. L.l. 40—47. . . . . 14. *A. apogonoides* p. 418.

b. Five to six rows of scales between l.l. and dorsal.

1. L.l. 44—46. . . . . 15. *A. confinis* p. 419.

2. L.l. 37—39. . . . . 16. *A. confinis occidentalis* p. 420.

c. Six rows of scales between l.l. and dorsal. L.l. 50—59 . . . . . 17. *A. macrolepis* p. 420.

Doubtful species . . . . . *Ambassis papuensis* p. 422.

1. Ambassis wolffi Blkr.

Ambassis Wolffii Bleeker, Nat. Tijdschr. Ned. Indië I. 1850, p. 9. — Nat. Verh. Holl. Maatsch. 3de Verz. deel II. 1847, Révision Ambassis p. 89. — Atl. ichth. VIII. 1876—1877, p. 133.

Ambassis robustus Günther, Cat. Brit. Mus. I. 1859, p. 222.

Ambassis robustus Steindachner, Arch. zool. anat. fisiol. III. fasc. I, 1864, p. 197.

Ambassis boulengeri Volz, Zool. Anz. XXVI. 1903, p. 553. — Zool. Jahrb. Abt. Syst. XIX. 1903, p. 352.

D. VII. I. 10 (11); A. III. 9 (10); P. 2.15; V. I. 5; L.l. 43—46; L.tr. $\frac{5—6}{1}$ $\frac{}{16—18}$ [1]).

Dorsal profile elevated, strongly convex from occiput to snout. Height 1.9—2.2, 2.4—3 in length with caudal. Head 2.4—2.6, 3—3.5 in length with caudal. Eye 2.6—3, snout somewhat more than interorbital space, which is equal to half diameter of eye. Mouth very oblique, lower jaw prominent, fitting with a symphysial knob in a median toothless depression of upper jaw. Jaws with bands of moderately pointed teeth, the outer row of upper jaw enlarged, specially those near symphysis. Teeth on vomer and palatines in narrow bands, those of vomer larger and conical. Praeorbital, praeoperculum and praeopercular ridge with a series of strong teeth, pointed backwards, similar but less distinct ones on interoperculum. Dorsal spines strong, the first one short, the second one very much longer and stronger than the others, much compressed and almost equal to head without snout; following spines decreasing gradually in length to the seventh, the eighth spine (the spine preceding the soft rays) much longer than the seventh and almost equal to snout and eye together. Soft part of dorsal rounded. First anal spine short, second one very strong and compressed, not much shorter than the second dorsal spine and much longer and stronger than the third anal spine, which is about equal to postorbital part of head. Pectorals and ventrals subequal, as long as second dorsal spine. Ventral spine strong, longer than third anal spine. Caudal deeply forked. Scales cycloid, about 26—33 scales before dorsal, seven longitudinal rows of scales on cheeks. Lateral line continuous, with a moderately curved arch below spinous dorsal, descending without abrupt bent to tail, where it is continued on middle of caudal peduncle, which is a little longer than deep, its depth equal to eye. Colour of alcohol specimens yellowish, with more or less silvery reflection. Distal part of dorsal, anal and ventrals dusky. Length over 200 mm. [Specimen of BLEEKER's collection in the Zoological Museum of Amsterdam seen by us].

Habitat: Sumatra (Palembang!); Borneo (Banjermassin, Kahajan, Pontianak, Baram basin); Celebes?. — Siam. In fresh water.

1) The scales of the sheath of the dorsal fin are excluded.

Note. STEINDACHNER says that his specimens came from Celebes. BLEEKER is probably right in supposing, that this must be a mistake.

2. **Ambassis gigas** Ramsay & Ogilby. [Fig. 97, pag. 399].

Ambassis gigas Ramsay & Ogilby, Proc. Linn. Soc. N. S. Wales (2) I. 1886, p. 9.
Ambassis gigas M. Weber, Nova Guinea IX. Livr. 4, 1913, p. 576.

D. VII. I. 10—11; A. III. 9—11; P. 2.15; V. I. 5; L.l. 39—40; Ltr. $\frac{5—6}{\frac{1}{12}}$.

Dorsal profile strongly ascending, with a slight depression at occiput. Profile of head and that between occiput and dorsal arched. Height 2—2.1, 2.5—2.8 in length with caudal. Head 2.7—3.7, 3.5—4 in length with caudal. Eye 3.3—3.8. Snout two thirds or three fourths of eye and about equal to convex interorbital space. Mouth oblique. Chin prominent. Maxillary reaching almost to below middle of eye, dilated posteriorly, its hindborder truncate at right angles. Narrow bands of villiform teeth in jaws and on palatines, stronger pointed ones in an outer series in jaws and in several rows on vomer. Praeorbital bluntly serrated. Horizontal border of praeoperculum and of praeopercular ridge serrated, a strong spine at angle of lastnamed. Interoperculum bluntly serrated near its posterior angle. Four to five rows of scales on cheeks. 18—21 scales between occiput and dorsal. First dorsal spine small, second one as long as head or as head without snout, much stronger and longer than the following, excepting the eighth, which is almost as strong as the second but shorter, being equal to postorbital part of head or half diameter of eye longer. Second anal spine much stronger and longer than third one, equal to postorbital part of head or to head without snout. Pectorals as long as head without snout or longer, somewhat longer than the ventrals, the spine of which is strong. Caudal deeply forked. Lateral line continuous. Least height of caudal peduncle equal to its length, slightly less than postorbital part of head. Colour of alcohol specimens yellowish brownish above with silvery reflections. Body and tail with longitudinal dark bands, following the rows of scales and disappearing on belly. A dark patch on opercle. Fins more

or less darkish in old specimens, hyaline or slightly dusky in younger ones. Length 280 mm.

Habitat: South New Guinea (Strickland river, Upper Digul river!, Lorentz river! and its tributaries!). — In fresh water.

3. Ambassis urotaenia Blkr.

Ambassis urotaenia Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 257. — Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révision Ambassis p. 92 — Atl. ichth. VIII. 1876—1877, p. 135.
Ambassis urotaenia Day, Fishes of India 4°, 1875—1878, p. 55.
Priopis lungi Jordan & Seale, Bull. Bureau Fish. XXVI. (1906) 1907, p. 18.
Ambassis urotaenia Evermann & Seale, l. c. p. 75.
Ambassis lungi Evermann & Seale, ibid.
Priopis lungi Seale & Bean, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 242.
Priopis urotaenia Seale & Bean, ibid.
Ambassis urotaenia de Beaufort, Bijdr. tot de Dierk. afl. XIX. 1913, p. 112.
Ambassis urotaenia M. Weber, Siboga Exp. Fische 1913, p. 216.

D. VII. I. 9 (10); A. III. 9 (10); P. 2.13—14; V. I. 5; L.l. 25—27; L.tr. $\frac{2}{\frac{1}{7—8}}$.

Dorsal profile ascending in a nearly straight line from snout to dorsal. Height 2.3—2.6, 3.2—3.5 in length with caudal. Head 2.5—2.9, 3.3—4 in length with caudal. Eye 2.4—2.6. Snout equal to or somewhat more than half diameter of eye. Interorbital space three fifths or two thirds of eye. Mouth very oblique, almost vertical. Maxillary reaching to below frontborder of eye, obliquely truncate posteriorly, its caudal border not emarginate. Teeth conical in narrow bands in jaws, in a more or less triangular patch on vomer and in a single row on palatines. Teeth on tongue. Praeorbital with some coarse denticulations. Praeopercular ridge with a spine at the edge, preceded by some smaller spines, all directed backwards. Lower border of praeoperculum with close serrations, continued along edge but greater part of vertical border smooth. Lower border of interoperculum smooth, sometimes with one or two serrations at its posterior end. One row of scales on cheeks, a few scales of a second, more superior row sometimes present, but often wanting. Dorsal separated from occiput by 8 to 9 scales. First dorsal spine small, second one longer and stronger than the others, equal to head without snout. Spine of second part of dorsal (eighth spine) shorter than second dorsal spine and equal to postorbital

part of head. Third anal spine somewhat longer than second, equal to postorbital part of head and one third diameter of eye. Free border of soft part of dorsal and anal straight. Caudal deeply forked. Pectorals equal to head without snout or a little longer. Ventrals equal to snout and eye. Least height of caudal peduncle about equal to its length and to postorbital part of head. Lateral line with a sharp curve downwards at about 13th perforate scale, below anterior part of soft dorsal; often interrupted here, but continued along median line of caudal. Colour of alcohol specimens yellowish, back dusky, silvery reflections on sides especially of head and a silvery longitudinal band from head to caudal. Median dorsal and ventral line blackish as also upper part of head and snout. Upper part of spinous dorsal between second to third spine blackish. Caudal with a dark longitudinal band along either lobe. Base of pectorals, ventrals and anterior part of anal more or less dusky. Length 100 mm.

Habitat: Pulu Weh!; Singapore; Sumatra (Benkulen, Priaman, Padang, Trussan, Siboga); Nias!; Banka; Madura!; Celebes (Makassar!, Dongala!, Menado); Sangir; Ternate; Batjan; Buru; Ceram!; Ambon!; Goram!; Waigeu!. — Coast of Natal, Seychelles; coast of British India, Philippines, Caroline islands, Fiji islands. In sea and estuaries, entering rivers.

4. **Ambassis kopsi** Blkr.

Ambassis Kopsii Bleeker, Nat. Tijdschr. Ned. Indië XV. 1858, p. 253.
Ambassis Kopsii Peters, Monatsber. Akad. Wiss. Berlin 1868, p. 255.
Ambassis Kopsi Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révision Ambassis p. 91. — Atl. ichth. VIII. 1876—1877, p. 134.
Ambassis Kopsii Steindachner, Sitzber. mathem.-naturw. Cl. Akad. Wien LX. I. 1870. p. 557.
Ambassis Kopsi Jordan & Seale, Bull. Bureau Fish. XXVI. (1906) 1907, p. 18.
Ambassis Kopsi Seale, Philippine Journ. Science V. n° 4, 1910, p. 274.

D. VII. I. 10—11; A. III. 8—9; P. 2.12; V. I. 5; L.l. 26—28; L. tr. $\frac{1\frac{1}{2}—2}{1}$ / $7\frac{1}{2}$.

Height 2.3—2.4, 3 in length with caudal. Head 2.4—2.6, 3.2—3.3 in length with caudal. Eye 2.8, a little more than snout. Interorbital space about two thirds of eye. Praeorbital, lower border of praeoperculum and horizontal part of prae-

opercular ridge serrated. Interoperculum feebly serrated. Mouth much oblique. Lower jaw the longer. Maxillary reaching to below anterior half of eye, posteriorly dilated, truncate at right angles with rounded corners and the hindborder emarginate. Two rows of scales on cheeks. Teeth small, in several rows in the jaws. No teeth on tongue. Eight or nine scales between occiput and dorsal. First dorsal spine small, second one longer than the others, equal to or shorter than head without snout. Second and third anal spines subequal, somewhat more than postorbital part of head. Pectorals somewhat longer than ventrals, exceeding postorbital part of head by about one half diameter of eye. Caudal deeply forked. Least height of caudal peduncle equal to its length and to postorbital part of head. Lateral line continuous, with a curve below dorsal. Colour of preserved specimens brownish, with a faint silvery lateral band and a lateral black stripe on tail. Tip of spinous part of dorsal black, other fins more or less dusky. Length 102 mm.

Habitat: Singapore; Banka; Borneo (Sandakan, Kota Baru!, Balikpapan!). — Philippines. In brackish water.

5. Ambassis commersoni C. V.

? *Sciaena safgha* Forskål, Descript. Animalium 1775, p. 53.
? *Centropomus ambassis* Lacepède, Hist. Nat. Poissons IV. 1802, p. 273.
Ambassis commersonii Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 176.
Ambassis Commersonii Bleeker, Verh. Bat. Gen. XXII. 1849, Perc. p. 30.
Ambassis macracanthus Bleeker, l.c. et Nat. Tijdschr. Ned. Indië IV. 1853, p. 455.
Ambassis batjanensis Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 196.
Ambassis commersonii Günther, Cat. Brit. Mus. I. 1859, p. 223 (s. syn.).
Ambassis batjanensis Günther, l.c. p. 225.
Ambassis productus Guichenot, Mém. Soc. Sc. nat. Cherb. XII. (2 Sér. T. II) 1866, p. 130 (fide Sauvage).
Ambassis Commersonii Klunzinger, Abh. zool. bot. Ges. Wien XX. 1870, p. 719.
Ambassis Commersonii Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révision Ambassis p. 95. — Atl. ichth. VIII. 1876—1877, p. 136.
Ambassis batjanensis Bleeker, l. primo c. p. 101 et l. secundo c. p. 138.
Ambassis commersoni Day, Fishes of India 4°. 1875—1878, p. 52.
Ambassis Commersonii Macleay, Descr. Cat. Austr. Fish. I. 1881, p. 37.
Ambassis Klunzingeri Steindachner, Ichth. Beitr. IX. Sitzber. mathem.-naturw. Cl. Akad. Wien LXXXII. I. (1880) 1881, p. 238.
Ambassis Klunzingeri Klunzinger, Fische d. Rothen Meeres I. 1884, p. 24.
Ambassis commersonii Sauvage, Poissons de Madagascar, 1891, p. 113.
Ambassis Commersonii Reuvens, Notes Leyden Mus. 1894, p. 145, 155.

Ambassis commersonii Jatzow & Lenz, Abh. Senckenb. Naturf. Ges. XXI. 1899, p. 499.
Ambassis ambassis Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII. 1905, p. 500.
Ambassis commersoni de Beaufort, Bijdrage tot de Dierkunde, Afl. 19, 1913, p. 113.
Ambassis Gründleri C. Popta, Meded. Mus. Leiden 1918, p. 3.
Chanda ambassis Chaudhuri, Mem. Ind. Mus. V. 1923, p. 715.
Ambassis commersoni Hora, Mem. Asiat. Soc. Bengal VI. 1924, p. 485.

D. VII. I. 9—10; A. III. 9—10; P. 2.11; V. 1.5; L.l. 27—29; L. tr. $\frac{3—3\frac{1}{2}}{1}$.
$\overline{8—9}$

Oblong, dorsal profile ascending in a curved line from snout to dorsal with a slight depression above eye. Height 2.5—2.8, 3.2—3.7 in length with caudal. Head 2.9—3, 3.6—4 in length with caudal. Eye 2.7—3.1. Snout about equal to interorbital space, which is two thirds or three fourths of eye. Mouth very oblique. Chin prominent. Maxillary reaching to below anterior border of pupil, somewhat dilated posteriorly, with the hindborder a little emarginate. Pointed teeth in three rows in upper jaw, in two rows in lower and in a single row on vomer and palatines. Teeth on tongue. Praeorbital coarsely serrated, as well as horizontal border of praeoperculum and praeopercular ridge, lastnamed with a stronger spine at angle. Interoperculum smooth, with a single spine at its posterior angle. Orbital rim rough. Supraorbital ridge smooth, ending posteriorly in a single spine. Two rows of scales on cheeks. Scales of nape smaller than those of body, 17—22 scales between occiput and dorsal. First dorsal spine minute, second one stronger and longer than the others [1]), almost as long as head. Third anal spine somewhat longer than second one and than eighth dorsal spine and equal to snout and eye. Pectorals shorter than head, but longer than ventrals, which are about equal to head without snout. Caudal deeply forked. Lateral line continuous, slightly ascending to below spinous part of dorsal and more abruptly descending again to median line of tail. Least height of caudal peduncle about 1.3 in its length, equal to postorbital part of head. Colour of preserved specimens yellowish brown with a silvery lateral band. Fin-

1) In one specimen we find the third spine somewhat longer, but much weaker than the second.

membrane between second and third dorsal spine dusky, blackish in its distal part. Length 94 mm.

Nomen indig.: Siriding.

Habitat: Singapore; Simalur!; Nias!; Sumatra (Benkulen, Priaman); Java (Batavia, Karangbollong); Bali; Borneo (Baram basin); Celebes (Makassar, Badjoa, Lagusi, Menado); Halmahera; Batjan; Ambon!; Buru!; Sumbawa; Sumba; Rotti; Timor; New Guinea (river Klipong!, British New Guinea). — From Madagascar and east coast of Africa, Mauritius, Seychelles, Red Sea, coasts of British India, Siam, Philippines to North Australia. In sea and fresh water.

Note. We have united *A. batjanensis* Blkr. with this species. The typical specimens seem to have been lost during BLEEKER's life, at least in the Catalogue of the sale of his collections this species is not mentioned and they are not in the Leiden Museum. We have however examined many specimens from the indo-australian Archipelago, which completely agree with BLEEKER's description of *batjanensis* and an examination of specimens of BLEEKER's collection in the Leiden Museum, named by him *A. commersoni*, quite agree with *A. batjanensis*. BLEEKER described his specimens of *A. commersoni* as having about 13 scales before the dorsal, but we found in these same specimens 18—20 praedorsal scales, in accordance with what he describes as the characteristics of *A. batjanensis*. DAY l. c. pointed out already, that *A. batjanensis* and *commersoni* are very closely related. We do not doubt that they are the same species.

6. Ambassis miops Gthr.

Ambassis miops Günther, Proc. Zool. Soc. 1871, p. 655. — Fische der Südsee I. 1873—1875, p. 18.
Ambassis myops Day, Fishes of India 4°, Suppl. 1888, p. 784.
Ambassis (*miops*?) M. Weber & de Beaufort, Nova Caledonia, Zool. vol. II. Livr. I. n° 2, 1915, p. 31.
Ambassis miops Sundara Raj, Rec. Ind. Mus. vol. XII. Prt. VI. 1916, p. 279.
Ambassis flores C. Popta, Mededel. Zool. Mus. Leiden, 1918, p. 4.

D. VII. I. 9; A. III. 9—10; P. 2.12; V. I. 5; L.l. 29—30; L. tr. $\frac{3}{1}$.
$\frac{}{8}$

Oblong. Dorsal profile gently ascending in an almost straight

line from snout to dorsal. Height 2.4—2.7, 3.1—3.5 in length with caudal. Head 2.7—3, 3.6—4 in length with caudal. Eye 2.7—2.8, about 1.3—1.5 in postorbital part of head. Snout shorter than eye. Interorbital space about three fourths of eye. Mouth very oblique. Maxillary reaching to below anterior border of eye or somewhat farther, its posterior end obliquely truncate, the hindborder not emarginate. Teeth in a single row in sides of jaws, in two or three rows near symphysis, where the outer teeth are somewhat curved backwards. Teeth on vomer and palatines in a single row. Teeth on root of tongue present. Praeorbital with some rather distant short spines. Praeopercular ridge with a spine at angle, preceded by some smaller spines, directed backwards. Lower border and inferior part of posterior border of praeoperculum with crowded denticulations. Orbital rim rough. Interoperculum smooth. Two rows of scales on cheeks. Dorsal separated by 13—16 scales from occiput. First dorsal spine small, second one stronger and longer than the others, equal to head without snout. Eighth spine slightly longer than anal spines, the third of which is longer than the second and somewhat more than postorbital part of head. Free border of soft dorsal and anal somewhat concave. Caudal deeply forked. Pectorals longer than head without snout. Ventrals equal to head without snout. Least height of caudal peduncle slightly less than its length, equal to or somewhat more than postorbital part of head. Lateral line complete, descending with a gentle curve from below dorsal to middle of tail. Colour of alcohol specimens brown; sides of head and a lateral band on head and body silvery. Membrane between second and third dorsal spine dark, as well as longitudinal band along each caudal lobe. Length nearly 90 mm.

Habitat: Flores; Ambon?; Goram!; North New Guinea (Fate river!). — Madras, New Caledonia, Rara Tonga. In sea and brackish water, entering rivers.

Note. The fry of this species has been described by SUNDARA RAJ l. c.

7. **Ambassis nalua** (H. B.)

Chanda nalua Hamilton Buchanan, Fishes Ganges 1822, p. 107.
Ambassis nalua Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 182.

Chanda nalua Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 988.
Ambassis nalua Bleeker, Verh. Bat. Gen. XXII. 1849, Perc. p. 29. — Nat. Tijdschr. Ned. Indië IV. 1853, p. 453.
Ambassis nalua Kner, Novara Exp. Fische, 1865—1867, p. 41.
Ambassis nalua Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révis. Ambassis. p. 94. — Atl. ichth. VIII. 1876—1877, p. 135.
Ambassis nalua Day, Fishes of India 4°, 1875—1878, p. 53.

D. VII. I. 10—11; A. III. 9 (10); P. 2.14—15; V. I. 5; L.l. 27—30; L. tr. $\frac{2\frac{1}{2}-3}{\frac{1}{8}}$.

Rather elevate, dorsal profile concave above eye, slightly convex between occiput and dorsal. Height 2—2.7, 2.5—3.5 in length with caudal. Head 2.5—2.8, 3.5—3.6 in length with caudal. Eye 2.4—2.9. Snout shorter than eye and somewhat less than interorbital space, which is four seventh or five seventh of eye. Mouth very oblique. Maxillary reaching to below frontborder of eye, its posterior end dilated, truncate at right angles, with the hindborder emarginate and the corners rounded. Teeth small, pointed, in two rows in jaws, in a single row on vomer and palatines. No teeth on tongue. Praeorbital rather strongly serrated as also lower edge and inner ridge of praeoperculum, the last with a stronger spine at angle. Orbital rim rough with a few blunt spines in its posterior part. Supraorbital ridge ending in a spine posteriorly. Interoperculum smooth or with a few very small indistinct spines near posterior angle. Two rows of scales on cheeks. Dorsal separated by 11—13 scales from occiput. First dorsal spine small, second one equal to head without snout or somewhat longer, third dorsal spine as long as snout and eye together, eighth spine slightly shorter than second and third anal spine which are about of the same length and equal to postorbital part of head. Pectorals as long as second dorsal spine, ventrals somewhat shorter. Caudal deeply forked. Lateral line continuous, with a gentle curve below dorsal. Least height of caudal peduncle about equal to its length and to postorbital part of head. Colour of alcohol specimens yellowish; sides of head and lateral band silvery. The membrane between second and third dorsal spine more or less dusky, darker in its terminal part, where it forms a black spot. In young specimens a dark stripe along base of soft dorsal and anal, continued behind these fins on caudal peduncle in the median

dorsal and ventral line. Length 125 mm. [Specimens of BLEEKER's collection in the Zoological Museum of Amsterdam seen by us].

Nomen indig.: Siriding (Malay Batavia), Tonkai (Javanese, Pasuruan).

Habitat: Singapore; Sumatra (Padang, Palembang); Banka; Java (Batavia!, Bantam, Panimbang, bay of Baron!, Samarang, Surabaya, Pasuruan); Madura; Borneo (Sinkawang, Sampit); Celebes (Makassar!, Tello!, Badjoa); Saleyer!; Sumbawa; Halmahera; Batjan; Ambon; Dammer!; Kei islands!. — Calcutta, Malabar coast, Andamans, Malacca, Pinang, Philippines. In sea, brackish and fresh water.

8. Ambassis agrammus Gthr.

Ambassis agrammus Günther, Ann. Mag. Nat. Hist. XX. (3) 1867, p. 57.
Ambassis agrammus Macleay, Descript. Cat. Austr. Fish. I. 1881, p. 38 (descr. copied from GÜNTHER).
Ambassis agrammus Ramsay & Ogilby, Proc. Linn. Soc. N. S. Wales (2) I. 1886, p. 8.
Priopis agrammus Jordan & Seale, Bull. Bur. Fisheries XXV. (1905) 1906, p. 255.

D. VII. I. 8; A. III. 8; Sq.l. 26—27.

Height 2.5 in length without caudal. Lateral line visible on foremost scale only. The second dorsal spine is longer than the third, much longer than the second and third anal spines, which are equal in length, not much shorter than the head and 3.5 in length without caudal. Uniform greenish olive, with a narrow bluish silvery band along the middle of the tail. [After GÜNTHER, not seen by us].

Habitat: British New Guinea. — Cape York.

9. Ambassis buton Popta.

Ambassis buton C. Popta, Meded. Zool. Museum Leiden 1918, p. 6.

D. VII. I. 9; A. III. 9; P. 2.13; V. I.5; L.l. 29; L.tr. $\frac{2—3}{1 \quad 8}$.

Oblong. Height 2.5, 3.2 in length with caudal. Head 2.8, 3.5 in length with caudal. Eye 3—3.2. Snout slightly more than interorbital space, 4 in head. Maxillary reaching to below anterior border of pupil, its posterior end somewhat dilated, the hinderborder oblique and slightly emarginate. Chin prominent. Mouth oblique. Pointed teeth in a few rows in jaws,

in a single row on vomer and palatines. Teeth on tongue. Praeorbital bluntly serrated. Praeoperculum and praeopercular ridge serrated in their horizontal part. Interoperculum smooth, with a single tooth at posterior angle. Orbital rim rough. Supraorbital ridge smooth, ending posteriorly in a single spine. Two rows of scales on cheeks. Dorsal separated from occiput by 14—16 scales. First dorsal spine small, second one less than head without snout. Third anal spine longer than second one, about equal to eighth dorsal spine and slightly less than eye and snout. Pectorals shorter than head, but longer than ventrals, which are equal to head without snout. Caudal deeply forked. Lateral line continuous or interrupted on one or both sides, the interruption being almost always of one scale only. Colour of alcohol specimen yellowish brown, sides of head and lateral band on body and tail silvery, accompanied by a bluish stripe. Membrane between second and third dorsal spine dusky, blackish distally. Length 103 mm.

Habitat: Buton; New Guinea (Sermowai river!). — In fresh water.

10. Ambassis gymnocephalus (Lac.)

? *Lutjanus gymnocephalus* Lacepède, Hist. Nat. Poissons III. 1802, tab. 23, fig. 3. l.c. IV. 1802, p. 216.
Ambassis Dussumieri Quoy & Gaimard, Voyage Astrolabe, 1826—1834, p. 650.
Ambassis Dussumieri Cuvier & Valenciennes, Hist. Nat. Poissons II. 1828, p. 181.
Priopis argyrozona Cuvier & Valenciennes, l. c. VI. 1830, p. 504 [1]).
Ambassis Dussumieri Bleeker, Verh. Bat. Gen. XXII. 1849, Percoïden, p. 30.
Chanda dussumieri Cantor, Journ. Asiat. Soc. Bengal XVIII. (1849) 1850, p. 988.
Ambassis dussumieri Günther, Cat. Brit. Mus. I. 1859, p. 225.
Ambassis dussumieri Kner, Novara Exp. Fische I 1865—1867, p. 41.
Ambassis Vachelli Peters, Monatsber. Akad. Wiss. Berlin 1868, p. 255 (nec Rich.).
Ambassis gymnocephalus Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révision Ambassis. p. 99. — Atl. ichth. VIII. 1876—1877, p. 138.
Ambassis gymnocephalus Day, Fishes of India 4°, 1875—1878, p. 54.
Ambassis Dussumieri Klunzinger, Sitzber. Akad. Wien 1880, p. 345.
Ambassis gymnocephalus Steindachner, Denkschr. Akad. Wien LXXI. 1902, p. 129.
Ambassis gymnocephalus Fowler, Proc. Acad. Nat. Science Philadelphia (2) LVII. 1905, p. 501.
Priopis gymnocephalus Jordan & Seale, Proc. U. S. Nat. Mus. XXVIII. 1905, p. 780.
Priopis gymnocephalus Seale, Philippine Journ. Science V. n° 4, 1910, p. 274.
Ambassis dussumieri de Beaufort, Bijdragen tot de Dierk. Afl. 19, 1913, p. 113.
Priopis gymnocephalus Chaudhuri, Mem. Indian Mus. V. 1923, p. 716.
Ambassis gymnocephalus Barnard, Ann. S. African Museum XXI. 1925—1927, p. 644.

1) See note page 422.

D. VII. I.9—10; A. III. 9—10; P. 2.12—13; V. I.5; L.l. 28—30; L.tr. $\frac{2—2\frac{1}{2}}{7—8}$.

Elongate. Height 2.8—3.3, 3.7—4.4 in length with caudal. Head 2.6—3.2, 3.6—4.3 in length with caudal. Eye 2.3—3. Snout about two thirds of eye and somewhat more than interorbital space. Mouth much oblique. Chin prominent. Maxillary reaching to below frontborder of eye or nearly so, its posterior end obliquely truncated. Villiform teeth in jaws, on vomer and palatines. Teeth on tongue. Praeorbital with blunt serrations. Inferior border of praeoperculum and of praeopercular ridge serrated, interoperculum smooth, its posterior angle pointed [1]). Orbital rim rough. Supraorbital ridge with three to four spines in its posterior part. Two rows of scales on cheeks. Dorsal separated by 14—16 scales from occiput. First dorsal spine small, second one equal to head without snout or somewhat longer, eighth spine shorter than snout and eye. Finmembrane attached to eighth spine near base, the dorsal fin thus almost divided. Third anal spine longer than second one, equal to snout and eye. Pectorals longer than ventrals, which are equal to head without snout. Caudal deeply forked. Lateral line interrupted below eighth dorsal spine, beginning again in median line of tail, often only one unperforated scale between the two parts, very seldom the lateral line is continuous, with a bent down where it is usually interrupted, sometimes the second part of the lateral line on tail is imperfectly developed. Least height of caudal peduncle about 1.5 in its length and equal to postorbital part of head. Colour of alcohol specimens yellowish brown, with silvery reflections on sides of head and body. A dark stripe in median line of tail, not always distinct. A black spot posteriorly on finmembrane between second and third and third and fourth dorsal spine. Tips of caudal and base of pectorals sometimes dusky. Length 72 mm.

Nom. indig.: Siriding (Malay), Sorgah and Pangkah (Javanese and Madurese).

Habitat: Singapore; Sumatra (Trussan, Padang); Bintang; Banka; Borneo (Balikpapan!, Baram basin); Java (mouth of Tjiliwong!, Batavia!, Bantam, Tegal, Semarang, Patjitan, Rembang,

1) In one specimen from unknown locality in the Museum of Amsterdam we find the interoperculum serrated.

Surabaya, Pasuruan); Madura; Bali; Celebes (Bulucomba, Menado); Buru; Ceram; Ambon; Timor; Waigeu!. — From coast of East Africa, British India to the Philippines and China and the northcoast of Australia. — In coastal waters, entering fresh water.

Note. Although the description given by LACEPÈDE is very unsufficient and even wrong in some points, as has been pointed out by one of us, we follow BLEEKER in calling this species *gymnocephalus*, as most authors have adopted that name.

11. **Ambassis reticulata** M. Web. [Fig. 98, pag. 414].

Ambassis interrupta M. Weber, Nova Guinea V. Livr. 2, 1908, p. 245 (nec BLEEKER).
Ambassis interrupta var. *reticulatus* M. Weber, l.c. IX. Livr. 4, 1913, p. 574.
Ambassis reticulatus Tate Regan, Trans. Zool. Soc. London XX. Prt. 6, 1914 p. 276.

D. VII. I. 8—10; A. III. 8—9; P. 13; V. I. 5; L.l. 26—28; L. tr. $\frac{2\frac{1}{2}—3}{1}$.
10

Oblong. Height about 2.3, 3 in length with caudal. Head 2.8, 3.9 in length with caudal. Eye nearly 3. Snout three

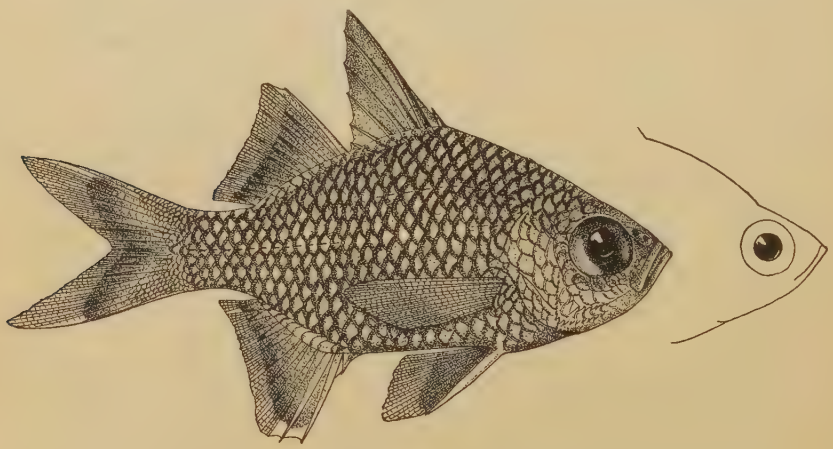

Fig. 98. *Ambassis reticulata* M. Web. × 4/3.
The line figure shows the inflected nape of a young specimen.

fourths or two thirds of eye, interorbital space three fourths of eye. Mouth much oblique. Chin somewhat prominent.

Maxillary reaching to below frontborder of eye, rounded behind. An outer row of pointed somewhat curved teeth in the upper jaw, which are larger than in the lower jaw, behind them an incomplete row of somewhat smaller teeth in both jaws. A single row of teeth on vomer, none on palatines. Teeth on tongue. Praeorbital with rather blunt, coarse serrations. Posterior and inferior border of praeoperculum and horizontal part of praeopercular ridge serrated. Orbital rim rough. Supraorbital ridges smooth, ending in a single spine behind. Interoperculum with about six serrations. Two rows of scales on cheeks. Dorsal separated by 12 scales from occiput. First dorsal spine small, second one longer and stronger than the others, equal to head or to head without snout. Finmembrane between 7th and 8th dorsal spine attached low down near base of 8th spine. Second anal spine about as long as eighth dorsal spine. Third anal spine a little longer, equal to postorbital part of head and half eye. Ventrals equal to head without snout; pectorals longer, but shorter than head. Caudal deeply forked. Lateral line interrupted below spinous part of dorsal, beginning again some scales farther backwards on median line of body, but often only partly developed or indicated by a few perforated scales. Least height of caudal peduncle slightly more than its length and than postorbital part of head. Colour of alcohol specimens yellowish, with a more or less distinct silvery lateral band. Each scale with a dark intramarginal band, which is connected with those of neighbouring scales; these bands forming a reticulated pattern on a lighter background. Fins more or less dusky, with an outer hyaline band. Length 92 mm. [Type of the species seen in the Zoological Museum of Amsterdam].

Habitat: South New Guinea (Merauke!, Lorentz river!, Setakwa river). In fresh water.

12. **Ambassis interrupta** Blkr.

Ambassis interrupta Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 696.
Ambassis macracanthus Day, Proc. Zool. Soc. London 1870, p. 681 (nec Blkr.)
Ambassis interrupta Peters, Monatsber. Akad. Berlin (1868) 1869, p. 255.
Ambassis interrupta Steindachner, Sitzber. Akad. Wien LX. I. 1870, p. 557.
Ambassis interrupta Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révis. Ambassis p. 97. — Atl. ichth. VIII. 1876—1877, p. 137.
Ambassis interrupta Day, Fishes of India 4°, 1875—1878, p. 53.
Ambassis interrupta von Martens, Preuss. Exp. nach Ost-Asien 1876, p. 386.

Priopis interruptus Jordan & Seale, Bull. Bur. Fish. XXVI. (1906) 1907, p. 18.
Priopis buruensis Jordan & Richardson, l. c. XXVII. (1907) 1908, p. 255 (nec Blkr.)
Ambassis interrupta M. Weber, Nova Guinea IX. Livr. 4, 1913, p. 574.

D. VII. I. 9 (10)[1]; A. III. 9—10 (11); P. 2.12; V. I. 5; L.l. 25—29; L. tr. $\frac{2\frac{1}{2}-3\frac{1}{2}}{7\frac{1}{2}-8}$.

Somewhat oblong, dorsal profile of head almost straight, that between occiput and dorsal arched. Height 2—2.3, 2.7—3 in length with caudal. Head 2.6—3, 3.5—4 in length with caudal. Eye 2.5—2.7. Snout about equal to interorbital space and about two thirds of eye. Mouth much oblique. Chin prominent. Maxillary reaching to below frontborder of eye or a little farther, its posterior end obliquely truncated. Small pointed teeth in a few rows in jaws, in a single row on vomer and palatines. Teeth on tongue. Praeorbital with pointed coarse serrations. Orbital rim with blunt serrations anteriorly. Supraorbital ridge smooth, ending behind in a single spine. Horizontal limb of praeoperculum and of praeopercular ridge strongly serrated, a larger spine at edge of praeopercular ridge. Interoperculum with 4—13 distinct serrations. Two rows of scales on cheeks. Dorsal separated by 12—15 scales from occiput. First dorsal spine small, second one much stronger and longer than the others, somewhat shorter or longer than head. Third anal spine slightly longer than second one, equal to postorbital part of head and two thirds of eye and half diameter of eye longer than eighth dorsal spine. Finmembrane between the two parts of the dorsal attached to basal fourth of eighth spine. Pectorals longer than ventrals, equal to or longer than head without snout. Caudal deeply forked. Lateral line interrupted below eighth dorsal spine, continued again some scales farther backwards on median line of tail. Least height of caudal peduncle slightly less than its length, equal to postorbital part of head. Colour of alcohol specimens yellowish brown. Opercles and a lateral median band on body and tail silvery. Membrane between second and third dorsal spine dusky. Length 120 mm. [Specimens of Bleeker's collection in the Zoological Museum of Amsterdam seen by us].

Nomen indig.: Siriding (Malay Batavia).

1) In one specimen from New Guinea we find the first soft dorsal ray converted into a spine the fin formula being D. VII. II. 8.

Habitat: Singapore; Engano; Java (Batavia!); Borneo (Banjermassin, Pontianak); Celebes (Makassar!, Menado, Gorontalo); Batjan; Buru!; Ceram!; Ambon; New Guinea (Siko!, Sermowai river!). — Andamans, Philippines, New Caledonia! — In coastal waters, entering rivers.

13. **Ambassis buruensis** Blkr.

Ambassis buruensis Bleeker, Nat. Tijdschr. Ned. Indië XI. 1856, p. 396. — Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révision Ambassis p. 98. — Atl. ichth. VIII. 1876—1877, p. 137.

Ambassis buroënsis M. Weber, Zool. Ergebnisse einer Reise nach Nied. O. Indiën Hft. 2, 1894, p. 408. — Jenaische Denkschr. VIII. 1895, p. 103.

? *Priopis buruensis* Jordan & Seale, Bull. Bur. Fisheries XXVI. (1906) 1907, p. 18.

? *Priopis buruensis* Jordan & Richardson, Bull. Bur. Fisheries XXVII. (1907) 1908, p. 255.

Ambassis buruensis de Beaufort, Bijdragen Dierk. Afl. 19, 1913, p. 113.

Ambassis gymnocephalus M. Weber, Siboga Exp. Fische 1913, p. 217 (nec Lac., nec Blkr.)

D. VII. I. 8—9; A. III. 8—10; P. 2.12; V. I. 5; L.l. 27—29; L. tr. $\frac{2—3}{1}$.
$\frac{}{7—8}$

Oblong. Height 2.3—2.7, 3.2—3.5 in length with caudal. Head 2.5—3, 3.4—3.9 in length with caudal. Eye 2.7. Snout about three fourths of eye and somewhat more than interorbital space. Mouth much oblique, chin slightly prominent. Maxillary reaching to below frontborder of eye, its posterior border obliquely truncated. Villiform teeth in jaws, vomer and palatines. Teeth on posterior part of tongue. Praeorbital with blunt serrations. Inferior border of praeoperculum and praeopercular ridge serrated, interoperculum smooth. Supraorbital ridge smooth, ending posteriorly in a single spine. Two rows of scales on cheeks. Dorsal separated by 13—16 scales from occiput. First dorsal spine small, second one somewhat longer than head without snout, eighth dorsal spine about equal to snout and eye and somewhat shorter than third anal spine, which is longer than the second one. Finmembrane between seventh and eighth dorsal spine attached low down, the two parts of the fin therefore more or less separated. Pectorals longer than ventrals, nearly as long as head. Caudal deeply forked. Lateral line interrupted below eighth dorsal spine and continued a few scales farther back along median line of tail. Least height of caudal peduncle a

little less than its length and somewhat more than postorbital part of head. Colour of alcohol specimens yellowish brown, with silvery reflections on sides of head and belly. A longitudinal silvery band from operculum to median caudal rays. A black stripe not always conspicuous along middle of sides of caudal peduncle. Finmembrane between second and third dorsal spine blackish. Caudal lobes somewhat dusky, other fins hyaline. Length 82 mm.

Habitat: Sumatra (Trussan); Java (Djankar!); Bali; Celebes (Makassar!, North Celebes, Pampanua!); Buru!; Ambon!; Timor!. — Philippines, New South Wales?. In coastal waters, entering rivers.

Note. This species is close to *A. gymnocephalus*, differing by the greater depth of body and caudal peduncle and by the presence of only one (terminal) spine on the supraorbital ridge.

14. Ambassis apogonoides Blkr.

Ambassis apogonoides Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 200.
Parambassis apogonides Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révision Ambassis. p. 103. — Atl. ichth. VIII. 1876—1877, p. 139.
Ambassis apogonoides Vaillant, Notes Leyden Mus. XXIV. 1902, p. 33.

D. VII. I. 10; A. III. 9; P. 2. 14—15; V. I. 5; L.l. 40—47; L. tr. $\frac{4}{1}$ $\frac{}{12—14}$.

Dorsal profile of snout rounded, that between occiput and dorsal arched. Height 2.5—2.7, 3.2—3.3 in length with caudal. Head 2.7—2.8, 3.4 in length with caudal. Eye 3.3. Snout equal to eye or a little more than eye. Interorbital space three fourths of eye. Mouth somewhat oblique. Maxillary dilated posteriorly and truncate at right angles, reaching to below anterior half of eye. Lower jaw scarcely longer than upper jaw. Small teeth in the jaws in a few rows, with an outer row of strong hooked caninoid distant teeth, more developed in the upper jaw. A series of small teeth on vomer and on palatines. Teeth on tongue. Praeorbital serrated, praeoperculum serrated below and posteriorly, praeopercular ridge with less distinct serrations along its horizontal part. Interoperculum with a few not very distinct serrations. Supraorbital ridge smooth, ending posteriorly in an indistinct blunt spine and sometimes followed by a few indistinct serrations. Five

rows of scales on cheeks. Dorsal separated by about 20 scales from occiput. Dorsal fin low; first dorsal spine about one fourth of second, which is scarcely longer than third and fourth spine and somewhat more than postorbital part of head; the following spines decrease slowly in length, the seventh is again a little longer than the sixth, the eighth is still longer and equal to postorbital part of head. First anal spine more than half length of second, which is much stronger, but not longer than the third one and as long as second dorsal spine. Pectorals as long as or longer than head without snout. Ventrals somewhat longer than postorbital part of head; the first soft ray is more or less filamentous. Caudal deeply forked, with pointed lobes. Least height of caudal peduncle about 1.3 in its length, less than postorbital part of head. Lateral line continuous, with a gentle curve below dorsal. Colour of preserved specimens yellowish; sides of head and opercles and a more or less distinct lateral band silvery. Fins yellowish, milky white at base. Spinous part of dorsal somewhat blackish at tip. Length 94 mm.

Nom. indig.: Gaba-gaba (Banjermassin).

Habitat: Sumatra (Muara-Kompeh, Djambi!); Borneo (Banjermassin, Mendalan river!, Kahajan, river Kapuas and river Mahakam). In rivers.

15. **Ambassis confinis** M. Web.

Ambassis confinis M. Weber, Nova Guinea IX. Livr. 4, 1913, p. 577.

D. VII. I.10—11; A. III. 9—10; P. 2.15; V. I. 5; L.l. 44—46; L. tr. $\frac{5—6}{1}$ $\frac{}{12—13}$.

Oblong. Profile of head convex, slightly concave at occiput and arched from there to dorsal. Height about 2.5, 3.5 in length with caudal. Head 3 or a little more, about 4.2 in length with caudal. Eye 2.5 or slightly more in head. Snout 1.5—1.7 in eye. Interorbital space slightly convex, 1.5 in eye. Mouth somewhat oblique, less so than in other species of *Ambassis* known to us. Lower jaw included. Maxillary reaching to below end of first third of eye. Small teeth in several rows in the jaws, in an incomplete double row on vomer and in a single row on palatines. The outer row of the upper jaw consists of enlarged hooked teeth. Praeorbital strongly ser-

rated. Hind and lower border of praeoperculum with strong, distant teeth; praeopercular ridge with similar teeth round its angle. Interoperculum with up to 8 serrations posteriorly. A few serrations in anterior part of suboperculum. Orbital rim serrated below and behind. Supraorbital ridge smooth, ending in a spine posteriorly. Three rows of scales on cheeks. Dorsal separated from occiput by about 14 scales. First dorsal spine small, second one not much stronger and longer than third and about equal to head without snout. Second anal spine stronger and slightly longer than third one, a little more than postorbital part of head. Pectorals a little more than head without snout. Ventrals a little less than this distance, their first soft ray may be filamentous. Caudal deeply forked. Lateral line continuous. Least height of caudal peduncle about 1.5 in its length, equal to postorbital part of head. Colour of alcohol specimens brown above, silvery below, the two colours separated by a broad black longitudinal band from operculum to base of caudal. Each lobe of caudal fin with a broad intramarginal black longitudinal band. Upper part of spinous part of dorsal blackish. Distal part of soft dorsal and a patch on middle of anal often blackish. Other fins hyaline. Length 122 mm. [Type in Zoological Museum of Amsterdam seen by us].

Habitat: New Guinea (Kaiserin Augusta river!). Fresh water.

16. **Ambassis confinis occidentalis** subsp. nova.

Ambassis confinis var. M. Weber, Nova Guinea IX. Livr. 4, 1913, p. 579.

This race differs only by its more marked concavity at nape, by having only 37—39 scales in the lateral line and by the colours being paler.

Habitat: New Guinea (river near Njao!, river Sermowai! mountain stream near Pioniersbivak on Mamberamo river!). In fresh water.

17. **Ambassis macrolepis** (Blkr.)

Bogoda macrolepis Bleeker, Acta Soc. Sc. Ind. Neerl. II. 1857, Tiende bijdr. vischfauna Borneo, p. 13.

Ambassis (Bogoda) microlepis von Martens, Arch. f. Naturgesch. 34. Jahrg. Bd. I. 1868, p. 9.

Parambassis microlepis Bleeker, Nat. Verh. Holl. Maatsch. v. Wetensch. 3de Verz. II. n° 2 (1873) 1874, Révision Ambassis p. 104. — Atl. ichth. VIII. 1876—1877, p. 140.

Ambassis macrolepis Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 110. — Notes Leyden Mus. XXIV. 1902, p. 33, p. 161.

D. VII. I. 10—11; A. III. 9—10; P. 2.12; V. I. 5; L.l. 50—59; L. tr. $\frac{6}{1}$ $\frac{}{18—25}$.

Dorsal profile of head nearly straight, sloping down to snout, that between head and dorsal arched. Height 2.4—2.7, 3—3.5 in length with caudal. Head 2.5—2.7, 3.2—3 5 in length with caudal. Eye 3—3.6, somewhat more or less than snout. Interorbital space about two thirds or three fourths of eye. Mouth oblique. Maxillary dilated posteriorly and truncate at right angles, with rounded corners and the hindmargin somewhat emarginate, reaching to below middle of eye. Lower jaw somewhat prominent. Teeth in upper jaw in four rows, in lower jaw in two rows, the teeth of the outer series in both jaws enlarged, curved and more distant. Small teeth in a single row on vomer and palatines. No teeth on tongue. Praeoperculum and horizontal margin of praeoperculum not very distinctly serrated, praeopercular ridge with a few denticulations near posterior edge. Interoperculum indistinctly serrated. Supraorbital ridge smooth, with no distinct spine posteriorly, 9—10 rows of scales on cheeks, the inferior scales smaller than the superior ones. Dorsal separated by 26—28 scales from occiput. Dorsal fin low. First spine small, second one somewhat stronger and longer than the others and shorter than head without snout. Spines gradually diminishing in size till the eighth, which is as long as the third one and somewhat more than postorbital part of head. Second anal spine longer and stronger than third, not much shorter than snout and eye together. Pectorals as long as head without snout, ventrals half diameter of eye shorter. First soft rays of ventrals somewhat filamentous. Caudal deeply forked, the lobes pointed. Lateral line complete, with an even curve below dorsal. Least height of caudal peduncle equal to eye, 1.1—1.2 in its length. Colour of preserved specimens yellowish, dusky above, especially on snout and nape. Faint indications of a rather narrow silvery lateral band. Upper border of spinous part of dorsal black, other vertical fins more or less dusky distally, lobes of caudal sometimes black-tipped. Length 94 mm.

Habitat: Sumatra (Batang hari!); Borneo (river Kapuas, Pontianak, Bunut!, Pulu Matjan, Danau Sriang, Mendalan river!). In fresh water.

Doubtful species.

1. Ambassis papuensis All. & Macl.

Ambassis Papuensis Alleyne & Macleay, Proc. Linn. Soc. N. S. Wales ser. 1, I. 1877, p. 266.
Priopis papuensis Jordan & Seale, Bull. Bur. Fish. XXV. (1905) 1906, p. 255.

D. VII. I. 9; A. III. 9; P. 13.

The height of the body is one-third of the length without the caudal fin. Diameter of orbit nearly half the length of the head. Second dorsal spine almost as long as the head. Third spine of anal fin longest. Operculum unarmed. Infraorbital and double edge of praeoperculum strongly denticulated, the teeth pointing backwards. Lateral line interrupted where it enters the median line. Colour, reddish yellow, with a silvery band on the median line and minute black dots along the back. A little black on the spinous dorsal and caudal fins. The latter is moderately forked. The procumbent spine in front of the dorsal fin is not visible.

This species was seen in dense shoals close to the southern shore of Hall Sound. Specimens were obtained by firing a charge of small shot into the thick of them. The wounded immediately came to the surface, and a few of the least injured were selected as specimens. [After ALLEYNE & MACLEAY, not seen by us].

Doubtful genus and species.

We draw here the attention to an other doubtful genus *Priopis* (Kuhl & Van Hasselt) from Java, described by Cuvier & Valenciennes (Hist. nat. Poissons VI. p. 503) as an addition to page 187 of their second volume containing „Chap. VIII, *Ambassis*". The french authors say about this fish: „Nous ne devons pas négliger de parler ici d'un petit poisson voisin des ambasses, sur lequel nous ne pouvons pas entrer dans de grands détails, parce que nous ne le connaissons que par un simple dessin au trait, qui s'est retrouvé parmi les nombreux travaux des infortunés Kuhl et Van Hasselt.

„Ces naturalistes avaient l'intention d'en faire un genre sous le nom de *priopis*, à cause des dentelures du frontal antérieur, qui lui donnent un sourcil dentelé en scie. Ce poisson a d'ailleurs la figure des ambasses, leurs deux dorsales,

leurs dents fines et égales aux mâchoires. Le dessin n'indique pas assez clairement si l'opercule a des épines et le préopercule des dentelures.

L'espèce dessinée a le corps alongé comme notre *ambassis oblonga*, et une bande argentée sur le corps; car Kuhl l'avait appelée *priopis argyrozona*. Ses nombres sont:

D. 7—1/7; A. 3/10, etc.

La ligne latérale est fortement arquée au-dessus de la pectorale. L'individu n'a que deux pouces de long.

Nous indiquons ce petit poisson, afin que les naturalistes voyageurs puissent nous le procurer et le faire connaître dans de plus grands details".

This genus is mentioned again by GÜNTHER (Cat. Brit. Mus. I. 1859, p. 222). He writes in footnote 4: „Priopis argyrozona, (Kuhl & v. Hass.) Cuv. & Val. VI. p. 503. Known from a drawing only: it may be placed for the present among the doubtful species of *Ambassis*, to which it is allied, though it may be the type of a separate genus. — Java."

Then Bleeker (Atlas ichth. VIII, 1876—77, p. 138) mentions „*Priopis argyrozona* K. v. H. Icon ined." with the remark: „Le *Priopis argyrozona* K. v. H., dont je possède le dessin original laissé par Kuhl et van Hasselt, n'est autre que l'*Ambassis gymnocephalus*, mais pris sur un individu à profil convex qu'il n'est communement dans cette espèce". He places it as a synonym under the lastnamed species.

We are not sure, that this supposition is right. But as the genus and species are founded on a drawing only, which probably is lost, we should not have revived them from oblivion, if the generic name *Priopis* had not been introduced again by Jordan & Seale (Proc. U. S. Nat. Mus. XXVIII (1905) 1906, p. 780) with the words: „The genus *Priopis* (Kuhl and van Hasselt) may be defined as Chanda (Ambassis) with the lateral line interrupted." Now we know by the quotations above, that Kuhl & van Hasselt never described a fish as *Priopis* but gave only that name to a drawing, from which Cuvier & Valenciennes made an incomplete description. But in that description no word is said, that the lateral line is interrupted as in *Ambassis agrammus* Gthr., *buruensis* Blkr., *interrupta* Blkr. and *gymnocephalus* (Lac.). The french authors say only: „La ligne latérale est fortement arquée au-dessus de la pectorale."

Jordan & Seale in reviving this genus of Cuvier & Valenciennes, were followed by Jordan & Richardson, by Seale & Bean and Chaudhuri, as recorded in the synonymy of our species of Ambassis, and also by Mc CULLOCH in his paper in the Zoolog. Results of the fishing Experiments carried out by the F. I. S. „Endeavour" Part I. 1911. He records in the „Family Ambassidae" the genus *Priopis* Kuhl & Van Hasselt, with the species *Priopis Ramsayi* Macleay, which is identical with *Pseudambassis ramsayi* Macleay, Proc. Linn. Soc. N. S. Wales V. 1881, p. 340. He gives an ample description of this species with its synonyms but of course no description of the genus *Priopis*, which indeed would be impossible, as there exists no description by KUHL & VAN HASSELT.

Genus, doubtful as to its taxonomic position:

Tetracentrum Macleay.

(MACLEAY, Proc. Linn. Soc. N. S. Wales VII. 1883, p. 256).

„Six branchiostegals. Teeth villiform with an outer series of larger ones; teeth on the vomer and palatine bones. One dorsal fin; the anal fin with four spines. Operculum without spine; praeoperculum with a double denticulated edge. Scales large, rather deciduous.

I place this genus with that section of the Percidae named by Dr. Gunther *Apogonina*, on account of a general resemblance in form, its large deciduous scales, and double-ridged praeoperculum. The continuous dorsal fin, and four spined anal, are however foreign to the group."

Note. MACLEAY has already at the end of this description drawn the attention to the discrepancies of his new genus from the Apogonidae. Perhaps it is nearer to *Ambassis*, but also from that genus it differs f. i. by the four spined anal. Perhaps also by other characters. But the diagnosis of the genus and also of the species is not complete enough, to make their taxonomic position sure.

In the literature about the fishes of New Guinea and the neighbouring parts of Australia we could not find any other description of the fish, which seems to be quite common in the fresh water of the south-eastern part of New Guinea.

D. Starr Jordan (A Classificat. of Fishes, Stanford Univ. Publications, Biol. Sc. III, 2, 1923, p. 189) places it in his Family 417. Ambassidae, which comprises the genera:

Chanda Hamilton 1822.
Ambassis (Commerson) Cuvier & Valenciennes, 1828.
Priopis (Kuhl & Van Hasselt) Cuvier & Valenciennes, 1830.
Hamiltonia Swainson, 1839.
Bogoda Bleeker, 1853.
Parambassis Bleeker, 1874.
Pseudambassis Bleeker 1876.
Acanthoperca Castelnau, 1878.
Pseudoambassis Castelnau, 1878.
Tetracentrum Macleay, 1883.

With exception of *Tetracentrum*, none of them has 4 spines in the anal.

But as we ourselves are in doubt, where to range it, we will leave it provisionally in this position.

1. Tetracentrum apogonoides Macleay.

Tetracentrum apogonoides Macleay, Proc. Linn. Soc. N. S. Wales VIII. 1883, p. 256.

„D. 9/10. A. 4/9. L.lat. 30. L.tr. 4/7.

Body elevated, compressed, the height being about one-half the length, exclusive of the caudal fin; the length of the head is one-third of the same. The profile from the first dorsal spine to above the eye, is much curved and forms a narrow ridge, above the eye it becomes broad and concave, and towards the snout convex and swollen. The eye is large, its diameter being about equal to the space between the eyes. The mouth is oblique, the lower jaw rather prominent; the maxillary reaches to the vertical from the anterior third of the eye. The inner double praeopercular edge is strongly toothed at the angle, the outer is very strongly denticulated along its entire edge, the suborbital, praeorbital, interoperculum and subopercular, are also denticulated on the lower edges. The dorsal fin takes its rise a little behind the vertical from the base of the pectorals, the first spine is less than half the size of the second, the ninth is a little longer than the eighth. They are all strong and curved a little backwards. The anal spines are strong, the first less than half the length of the others. The caudal fin is somewhat long, with the lobes rather produced. The scales cover the whole body except the top

of the head, a single row of smaller scales protects the base of the soft dorsal and anal fins. The colour of the larger specimens is uniform dull silvery gray, but young specimens show a black blotch above the anal spines, and something resembling a black vitta on the posterior portion of the lateral line; there seems also to have been a black opercular patch.

A number of specimens were brought from Goldie River and other fresh water streams, varying in size from 7 to 2 inches in length." [After MACLEAY, not seen by us].

ADDENDA AND CORRIGENDA.

p. 7. *Bregmaceros macclellandi* Thompson is mentioned by BARNARD (Mar. Fishes of South Africa. Ann. S. African Mus. XXI. 1925, p. 3) from Agulhas Bank to coast of Natal in 30—185 fths., and by MC CULLOCH (Rec. Australian Mus. 1926, p. 29) from North Western Australia.

p. 32. 17th line from below „*Metaeocephalus*" must be read „*Mataeocephalus*".

p. 64. *Malacocephalus laevis* (Lowe) is recorded from Australia in 350—450 faths. depth by WAITE (Rec. South Austral. Mus. III. 1927, p. 229).

p. 91. Fig. 22 *Regalecus gradius* C.V. must be read „*Regalecus gladius*".

p. 95. As already remarked in the Introduction, the pages 95—213 left the press before the valuable papers about australian and indian Flatfishes by J. R. NORMAN: „Biol. Res. „Endeavour" V, 1926, p.p. 219—308" and Rec. Ind. Mus. vol. XXIX. Part I, 1927, pp. 7—48 and vol. XXX. Part II, 1928, pp. 173—215" appeared. They contain new localities not quoted in the „habitat" of some of our species and also some generic and specific names differing from those used by us.

p. 98. *Psettodes erumei* (Bl. Sch.) recorded by NORMAN (Biol. Res. „Endeavour" p. 221) from Queensland.

p. 110. *Pseudorhombus affinis* M. W. is according to NORMAN (Rec. Ind. Mus. XXIX. 1927, p. 15) a synonym of *Ps. elevatus* Ogilby, Mem. Queensland Mus. I. 1912, p. 45 and NORMAN, Biol. Res. „Endeavour" p. 34.

p. 114. *Pseudorhombus argus* M. Web. recorded by NORMAN (Biol. Res. „Endeavour" p. 237) from Queensland.

p. 119. *Bothus (Platophrys) polyophthalmus* (Blkr.) is brought by NORMAN (Biol. Res. „Endeavour" p. 253) in the new genus *Grammatobothus* Norman.

p. 125. *Bothus (Anticitharus) polyspilus* (Gthr.). New locality: Mergui Archipelago (NORMAN, Rec. Ind. Mus. XXIX. 1927, p. 31).

p. 129. *Bothus (Arnoglossus) mogki* (Blkr.) is according to NORMAN (Rec. Ind. Mus. XXIX. 1927, p. 27) also distributed in the Indian Ocean.

p. 129. *Bothus (Arnoglossus) brevirictis* (Alc.). NORMAN (Rec. Ind. Mus. XXIX. 1927, p. 23) created for this species the genus *Crossolepis*.

p. 131. *Bothus (Arnoglossus) intermedius* (Blkr.) recorded by NORMAN (Biol. Res. „Endeavour" V, 1926, p. 249) from Queensland.

p. 133. add: *Bothus (Arnoglossus) cocosensis* Blkr. which was omitted by us as only known from Cocos Islands, therefore outside our area; but it occurs, according to NORMAN (Rec. Ind. Mus. XXIX. 1927, p. 24) also at Sumatra. We reprint therefore the description as given by Norman:

Engyprosopon cocosensis (Bleeker).

Rhombus cocosensis, Bleeker, Nat. Tijdschr. Ned. Ind., VIII, p. 197, (1855).

Platophrys (Arnoglossus) cocosensis Bleeker, Atl. Ichth., VI, p. 13, Pleuron. pl. IV, fig. 1, (1866).

Scianectes macrophthalmus (part), Jenkins, Mem. Ind. Mus., III, p. 27, (1910).

„Depth of body twice or a little more than twice in the length, length of head $3^2/_5$ to $3^3/_5$. Snout shorter than eye, diameter of which is 3 to $3^1/_4$ in length of head; anterior margins of eyes level, or lower a little in advance of upper; interorbital space concave, narrow in both sexes, width $^1/_5$ to $^1/_3$ (♂) or $^1/_8$ to $^1/_4$ (♀) of diameter of eye. Males with a short spine on the snout. Maxillary extending to below middle of eye or not quite as far, length $2^1/_5$ to $2^2/_5$ in head. Teeth uniserial (?) in both jaws, enlarged anteriorly. Gill-rakers rather short, 5 to 7 on lower part of anterior

arch. Scales not very adherent, those of ocular side weakly ciliated, those of blind side cycloid; about 40 scales in a longitudinal series [1]). Dorsal 77—84. Anal 59—63. Left pectoral with the upper ray prolonged in the male, length $^3/_4$ to $^4/_5$ that of head; right pectoral shorter. Brownish, with traces of some paler areas, and with some black spots and blotches; vertical fins with dark spots; left pectoral with 2 or 3 dusky bars.

Described from 12 specimens, 40 to 65 mm. in total length.

Hab. — Travancore Coast (?); coast of Burma; Nicobar Islands; Cocos Islands; Sumatra.

Dr. L. F. de Beaufort has kindly compared two of these specimens with material of *E. cocosensis* in the Zoological Museum, Amsterdam, and confirms my identification. This species may be readily distinguished from all other species of the genus by the larger mouth."

p. 137. *Poecilopsetta colorata* Gthr. — NORMAN (Rec. Ind. Mus. XXIV. 1927, p. 42) unites with this species *Poecilopsetta maculosa* Alcock and gives to *Poecilopsetta praelonga* Alcock, which we considered as a synonym of *P. maculosa* the value of a distinct species. But he considers *Boopsetta praelonga* Brauer (Valdivia Exped.) with a query as a synonym of *colorata*.

p. 142. *Samariscus huysmani* M. Web. recorded by NORMAN (Rec. Ind. Mus XXIX. 1927, p. 47) from Gulf of Martaban.

p. 148. *Solea humilis* Cantor (1850) is preceded by *Solea ovata* Richardson, Rep. Brit. Assoc. Adv. Sc. 1845 (1846) p. 279.

p. 155. *Aseraggodes kaianus* (Gthr.). — CHABANAUD (Bull. Inst. Oceanogr. Monaco n° 500, 1927, p. 14) ranges this species under the synonymy of *A. guttulatus* Kaup.

p. 158. *Liachirus melanospilus* (Blkr.), add to habitat: Sintang, Borneo (Zool. Mus. Amsterdam).

p. 160. *Achirus hartzfeldi* Blkr. add to synonymy: *Heteromyc-*

1) In the „Atlas Ichthyologique" Bleeker gives 55 scales in a longitudinal series for this species, but in his original description the number was given as 45.

teris hartzfeldi Chabanaud (Ann. Mag. Nat. Hist. (9) 1927, p. 526).

p. 169. *Synaptura albomaculata* Kaup, by NORMAN (Rec. Ind. Mus. XXX. 1928, p. 179) under the name *Brachirus albomaculatus* (Kaup).

p. 172. *Synaptura macrolepis* Blkr. New locality: coast of Orissa (NORMAN, Rec. Ind. Mus. XXX. 1928, p. 181).

p. 178. *Synaptura altipinnis* Alc. by NORMAN (Rec. Ind. Mus. XXX. 1928, p. 184) under the name *Zebrias altipinnis* (Alc.)

p. 202. *Cynoglossus sumatranus* (Blkr.). New localities: Burma, Mergui Archipelago (NORMAN, Rec. Ind. Mus. XXX. 1928, p. 209).

p. 237. *Holocentrum spiniferum* (Forsk.) is recorded by WHITLEY (Records Austr. Mus. XVI. 1927, p. 11) from North Queensland.

p. 256. *Myripristis hexagonus* Lac. Add to the habitat: Banda (Zool. Mus. Amsterdam).

p. 264. *Melamphaës malayanus* M. W. — Mr. J. R. NORMAN, after comparing the type specimen with *M. robustus* Gthr., expressed in a letter his opinion, that he is pretty sure, that the very young specimen is synonymous with *M. robustus* Gthr.

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1) As in Java the three languages: javanese, sundanese and malay are spoken, we have accordingly placed behind the indigenous names (Malay.), (Sundan.) or (Javan.). In naming a fish the malay people use as a rule "ikan" = fish before the special name. In most cases we have omitted "ikan".

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